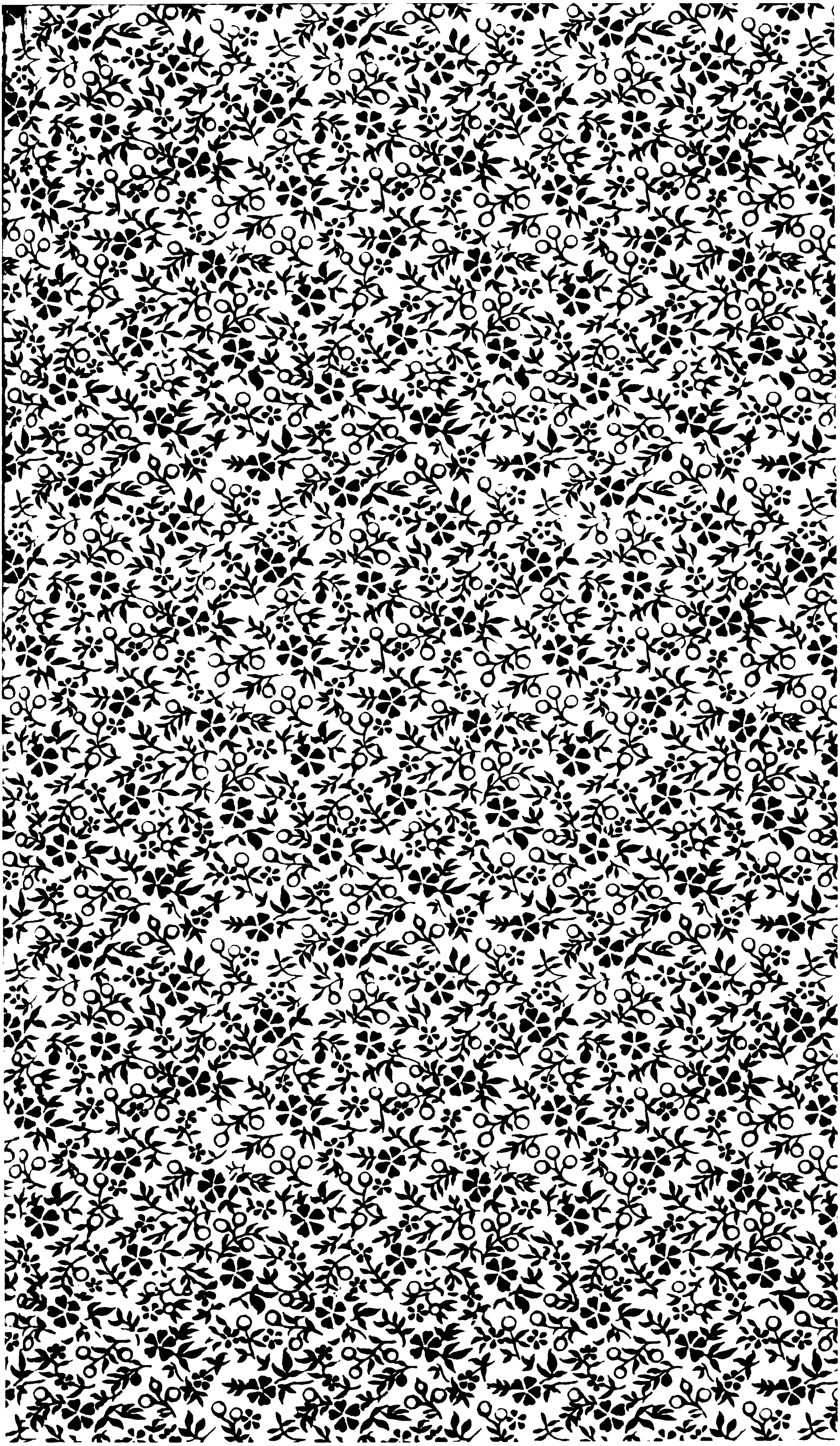

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VOLUME XII FOR 1900

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PREFACE

IN placing the Twelfth Volume of the INTERNATIONAL ANNUAL before the public, we would extend our hearty thanks to its many friends, old and new, who by their generous co-operation in the contribution of articles and illustrations have made its production possible. The preparation and compilation of material so cheerfully provided is a pleasant task, and one that brings us into close fellowship with each other. It has been our aim to make the present volume as perfect in its technical execution as possible, that it may stand as an example of good book-making throughout. Our thanks are due to our publishers for their liberal policy and support toward this end.

THE EDITOR.

New York, November, 1899.

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Views at Monaco — *G. E. Thompson*

always be done with a lens or other magnifier. When working on any particular piece of work, I consider it a very good plan to choose the same time each day, if possible, so that the actinic value of the light may be as nearly as possible constant. I am fully convinced of the value of a photometer for estimating exposure, as the light in old buildings is frequently very deceptive. In the photographic survey in England suggested by the Society of Antiquaries it is usual to photograph a three-foot scale, partly divided into inches and feet and partly into metric divisions, in each picture, and it is a plan well worthy of adoption by every one engaged in work of this sort, as it, of course, considerably enhances the value of the photographs if one can always afterward get accurate dimensions from them. The scales are printed very boldly on paper, and require mounting. They can be obtained from the Society of Antiquaries, London. In my experience isochromatic plates give rather better results than ordinary ones. I have no doubt that pyrogallic acid is the right developer to use, as it does not clog the high lights even when photographing very white stonework. I think every one will agree that platinum is the printing process par excellence for work of this description.

MONACO AND MONTE CARLO

By G. E. Thompson

(Illustrations by the Author)

"FOR the love of money is the root of all evil."—I. Timothy, vi., 10.

His Serene Highness Prince Albert of Monaco represents the oldest reigning family in Europe. Small though his country, its history dates back to the year 980, when Giballin Gramaldi, a Genoese noble, was awarded the principality for his prowess in ousting the Moorish pirates from Eza, a little mountain town crowning a height between Monaco and Nice. Part of the principality now enjoys a world-wide, though not altogether enviable, renown from the fact that there stands the chief gambling-house, the black spot of Europe. Monte Carlo, taking its name from the late blind Prince Charles, is known all the world over.

From Mentone to Monaco the distance is scarcely seven miles. The railway crosses Cape Martin, continuing westward along the beautiful seacoast. The first point reached in the principality is Monte Carlo, its station immediately below the Casino; then the bay of Condamine, with its mass of hotels and shops, is passed, and the station of Monaco, below the rock on which the town stands, being soon left behind, you have quitted the principality, and with it the

small state, only measuring three and a half miles in its greatest length.

. . . .

From my diary, March 12, 1899: Mentone.—The sun has not shown his face here for four days, but rolling clouds, wind with occasional rain, and log fires have taken his place. This morning he is back to business. The clouds have fled to Africa or England; the wind has collapsed, and a serene blue sky overspreads a calm indigo sea, looking down on a few white sails and the distant purple headland of Monaco, with the white buildings on Monte Carlo glistening in the west.

Our party of seven were to follow their various devices for the day. The Professor wandered off up the mountains to hunt ferns and brigands; others departed for the beautiful garden belonging to Mr. Hanbury, at La Mortola; the sketcher went forth to sketch; while I, after an early breakfast, caught the train, and was soon enjoying the hot sunshine among the scented pines, aloes, and prickly-pear groves which clothe the cliffs of Monaco.

But before ascending to the town, I wandered along the quay, taking a few views of the yachts and shipping in the bay. An unwonted bustle pervaded the usually quiet port. Crimson cloth lay along the pier, betokening unusual festivities. Walking up the steep incline to the town, I passed under the frowning portal with the date 1533 over its arch. In the piazza in front of the palace flags were being hoisted, while a few generals and inferior officers of the miniature army stood about airing their gorgeous uniforms. A narrow pathway leads along the summit of the rock on the west side, skirting the wall and ancient bastions, the regularity being broken by little watch-towers and tourelles, each one a picture, with conical red roof and loop-holes overhanging the sea, the creeper-grown walls, and masses of vegetation. Surely no town has a more beautifully situated park than that of Monaco, for it continues down and around the end of the rock with a perfect maze of pathways wandering up and down the cliffs, among the shady groves and brilliant flowers. Seats occupy the many vantage points, where you can bask in peace, listening to the songs of the birds, and gazing over the sunlit sea or along the coast to where the Tête du Chien and other heights with their villages form a noble background to this Paradise.

I quitted the gardens for a few minutes to photograph the façade of the new fine gray stone cathedral, and then, continuing around the southern end of the promontory where a fine avenue shades the road, I looked down on the port. Nor was I the only person so engaged, for the walls of the roads along the eastern side of Monaco were becoming thickly lined with people. This sight caused me to hasten. I reached the wide quay, but was politely repulsed by an official, whereupon, with other loafers, I took to the sandy shores of the little bay. A breeze had sprung up, and the white-tipped waves came rolling in gallantly.

The diminutive army of the principality, with their brazen helmets and gorgeous panoply of war, were spread in full glory along the quay. The high and showily dressed officials were there also. The quay, the roads leading up this side of the rock in three heights, and every inch along the walls were occupied by the inhabitants or strangers. Gayly colored parasols stood out against the green background of gardens, and the flag of Monaco waved proudly below. What did it all mean? I turned to one of the many boys on the shore to inquire. He replied that the Prince of Monaco would shortly land from his yacht, which was now approaching, being, he believed, already off Mentone. Every one appeared to be on the tiptoe of expectation; the army stood at ease; the select upper ten formed a line along the quay, and now two open landaus containing members of the family and court drove rapidly down from the palace.

Presently the sound of cannon boomed out from above, the report grandly reverberating from the mountains over the bay beyond Monte Carlo. You think that one of the old-time bombardments was taking place. All eyes were directed out to sea, and the sound of the guns had scarcely died when the Prince's steam yacht, "Princess

Alice," steamed into the bay, soon swinging around and dropping her anchor. Again the artillery sounded as a white boat bearing the flag of Monaco in her stern was rowed swiftly up to the pier.

And now the sounds of sackbut, psaltery, and harp were heard; in other words, the band blazed out with the National Anthem as His Serene Highness the Prince of Monaco stepped on the pier and embraced the Princess. As the party drove off to the palace, the cannons again belched forth, and the gratified crowd dispersed to their own homes.

Along with the rest of the common herd I made my way through Condamine toward Monte Carlo. The gardens of the Casino looked lovely and inviting for a quiet stroll among the palms, evergreens, and flowers. Picturesque points of view abounded, and the camera was soon at work. In a sheltered nook of the little park there is a pen of Moufflon, the wild mountain sheep of Corsica. These animals

wear long, curved horns and have the skin and hair of deer. They were very tame, and were glad to nibble cheese, though bread seemed to be beneath their aristocratic notice.

The broad flight of steps leading up to the doors of the Casino presented a picture worth watching. There were carriages constantly arriving, their well-dressed occupants making eagerly for the gambling saloons, while numbers of pedestrians helped to swell the unceasing crowd desirous of entering the broad way leading more or less to destruction. Many also issued forth from the interior, and, as I stood on the steps watching, I noticed a preponderance of disappointed and harassed faces among those descending.

Putting on a bold face, I entered, but was told to go to a certain office and deposit my parcels. This being done, I entered the office, where sat a number of officials, whose business it was to scan each visitor, and, if thought to be a fit and proper person, to provide the individual with a ticket for the gambling saloons. This ticket was free and lasted for the day of issue. I underwent scrutiny, and was universally condemned. And why? Because, forsooth, I wore a Norfolk jacket. I was politely told that the line must be drawn at belt and buttons such as those I sported. From this high tribunal there is no appeal. I could not be allowed to ruin myself and bring disgrace on my family in those clothes. Gentlemen in knickerbockers were also excluded, so I was not alone as an outsider. Fortunately my scanty wardrobe at Mentone boasted a black coat. I would return another day. Meanwhile I walked around to the grand terraces on the side of the building facing the sea. The sun shone gloriously, and the groups of promenaders stimulated picture-making, and photography went on gayly.

. . . .

At the Hotel Garavan, Mentone, dinner was timed so that visitors who inclined might rise from the table to catch the evening train to Monte Carlo. A look down the long tables told its story, for the ladies intent on this particular form of dissipation would appear in their hats—works of art, each of them—and in costumes that were

calculated to collect a crowd if exhibited in a Parisian milliner's establishment. And the ladies themselves! I remember—but no, that's telling—I remember nothing .

One evening soon after the events described, with others of our party, I joined the early stampede from the dinner table. It was dark, and as the train neared Monte Carlo we looked forth from the windows on an illuminated fairyland. There was the rock of Monaco jutting out into the dark sea, a sombre setting to the brilliant jewel in front. The terraces, casino, and gardens of Monte Carlo were a blaze of light. In the restaurant facing the Casino were crowds of diners, to whom a string-band discoursed sweet music.

The black coat was passed at once. Name? Hotel? Nationality? Age? Was I over twenty-one? "Yes." Got my ticket, and entered the fatal doors.

I had been there in the year 1898, and was now astonished at the great changes. The place had grown: a large new saloon had been added, the walls being decorated by painted panels with sporting pictures, outdoor games, etc. There are, if I remember rightly, fourteen tables in all. Each table will probably seat forty or fifty gamblers, and many more can stand behind those seated.

As regards gambling, the bank realizes large sums each day; thus it stands to reason that in the generality of cases the players lose heavily. On the roulette tables, the lowest sum which a player may stake is five francs, the largest £240. When the roulette in the centre of the table is spun round, a marble is set running in the contrary direction inside. This is the time for placing your money on the table. When the marble falls into one of the thirty-seven stalls into which the wheel is divided, no more money may be placed. The result is declared: the money of the losers is raked up by the croupiers; the bankers throw the winners their amounts, and the whole process is repeated.

In the game of Trente et Quarante, which is played with cards, the smallest sum allowed on by the player is twenty francs, the largest £480. On these tables fortunes may be gambled away in a few minutes.

After watching the games for some hours, I have come to the conclusion that there is only one really good system, and that is the one found out and given free to the world by Mr. Punch. At the same time it is not a system which would entirely commend itself to the proprietors of the Casino, nor would it receive the unqualified votes of the larger proportion of players. Mr. Punch says that, after much observation, he found out a way not to lose at all: "Don't play."

I can speak from experience of the correctness of Mr. Punch's method.

THE PICKLE PROCESS FOR INTERIORS

SOME EXPERIENCES WITH AN OLD DEVELOPER.—ADDRESSED TO AMATEURS WITH APPETITES.

BY JOHN J. WOOLNOUGH

A GLORIOUS day, a perfect day, I sigh
  Full of content, while in the leafy shade
Upon a hammock stretched at full I lie,
  And with tobacco's soporific aid
All of the day's delights before me pass,
Just as I saw them on the screen's ground glass!

Early that morning, ere the early bird
  Had met the hapless worm, I seized my Kit.
Visions of subjects rare within me stirred,
  And hopes of something that would make a hit.
Far from the city's throng I fled in haste,
And found some spots exactly to my taste.

All the long day Dame Fortune has been kind;
Where'er I turned some subject would I find;
  Reveled delighted 'round an old-time farm,
  Whose every corner wore some special charm;
Till, tired and hungry, I eased up a spell
For a much-needed meal, at this hotel.

A meal where superb pickles played a part
Weaned me for once from every thought of art;
  But, now the inner man has been supplied,
  I look back on my day's work full of pride.
Then to my camera, standing quietly by,
I thus addressed a short soliloquy:

" O best of friends! for ten years you have been
Faithful recorder of each pleasing scene.
  Though up to date indeed when you were made,
  I think I'll have to part with you—in trade."
Imagining it shuddered as I spoke,
I fell asleep, and dreamed that I awoke.

. . . .

Standing with legs stretched wide, my body bent,
I tried to puzzle out what this all meant.
  Then muttered, " Must have walked so far to-day,
  I've actually worn my feet away!
It's evident my legs end in a point
An inch or two above the ankle-joint."

My arms both rigid, forced back out of place,
Apparently now form a swing-back brace;
  And where my spinal column used to stand,
  A rackwork lies for focusing by hand;
Quite interested, I my ribs behold
Converted to a bellows many fold.

My cap hung by a string, and my bald pate
Served as a lens working about F 8;
  Somewhere across my back I took for granted
  A screen for focusing was firmly planted;
I trembled as I felt beneath my shoulder
Some one inserting slowly a plate-holder.

" Well, if I'm down to stop down," I declared,
  " This is no snap." Just then an awful voice,
Whose strange, unearthly sound left me quite scared,
  Said: " Yes, I think there is no other choice
Than to stop down and give it lots of time.
To snap at that would almost be a crime!"

A sudden pain, my brain quick ope'd and closed,
" Ha, ha!" I smiled—" another plate exposed "—
  Soon after that, I heard the same voice utter—
  " Now here's a bit where I can use the shutter,
I merely press this button and the camera does the rest "—
So he merely pressed the button on my summer under vest!

" Great Scott!" I groaned, " I hope this won't last long.
I never was particularly strong."
  Just then, to my amazement, did I see
  The party that manipulated me,
Strutting around on three legs, as if it owned the place:
My camera (my best of friends!) and I were face to face!

Then all grew blurred and dark. I knew no more
Till focused on a church interior,
  Where the stained light, poor in actinic power,
  Would need, I judged, exposure of an hour.
The voice remarked: "Ten minutes will suffice!
Ten minutes——"

. . . .

——"Sir, I've had to call you twice!"

"Ten minutes, sir, is all the time you've got
To catch your train." I started as if shot,
  Shouldered the partner of my tribulation,
  And reached, barely in time, the railroad station.
I've registered a solemn vow I ever mean to keep,
Not to indulge in pickles before I fall asleep!

ONE REMEDY FOR PINHOLES

By Ottomar Jarecki

THE easiest way to account for pinholes in negatives is to blame the plates. Once in a while this hits the case, but in the majority of instances, the writer believes, the trouble is entirely home-made. Starting out with the supposition that the plates are carefully dusted before they go into the plate-holders, that also these latter have been dusted and the slides themselves, about all the precautions possible at this stage have been taken. Attention might be called to the fact that hard-rubber slides become electrical by rubbing, and special care must be taken that no lint adheres. Many operators make trouble for themselves by wetting the plates before development. This is as likely as not to produce air bubbles, and afterward pinholes by keeping the developer from touching the plate in these spots. Let any one hold a plate under the tap and examine afterward in a good light, and the chances are strongly in favor of finding small bubbles here and there on the surface. Whether this comes from splashing of water or other cause, it certainly does happen, and many have got entirely over their pinhole troubles by leaving off this preliminary wetting. It will also be within the experience of everybody that, on lowering a negative into a dish of solution in the course of any after-treatment of the plate, in this case as well small bubbles will form which cannot be dislodged by rocking the tray. In either of these instances all bubbles would be removed by a slight swabbing with a tuft of absorbent or filtering cotton. Why not, therefore, apply this remedy to the plate while it is in the developing dish? This has been

Engraved by J. Manz & Co., Chicago

WINOOSKI RIVER, MONTPELIER, VT.

By Robert Wilkinson

the writer's practice, and has practically abolished pinholes, such as arise from dust on the plate. The exposed plate is transferred to the dish without dusting it, the developer is poured on, and as soon as the plate is evenly wet, a swab of cotton is lightly mopped over the surface. This may then be squeezed dry and hung over the edge of the graduate, and is thus kept clean and ready at hand for the next plate of the series. It is true that a brush may be and has been used for the same purpose, but it is more troublesome to keep clean, absorbs much developer, and has other drawbacks. Let any one afflicted with pinholes try this method, and I am sure he will be able to report progress.

From the Studio *By Dana*

It is also far from the universal practice, which it ought to be, to swab the negatives with a wad of wet cotton after the final washing. Few waters are free from grit or floating particles that will make trouble unless removed at this stage.

THE HANGING OF PICTURES

By F. C. Lambert

ONE of the points which is practically always ignored by those responsible for the hanging of pictures in our exhibitions is the point of view of the spectator, i. e., his horizon relative to that of the picture. It does not seem ever to occur to these merry gentlemen that, by hanging a picture with, say, a low horizon low down, i. e., below the eye, or one with a high horizon high on the wall, they are practically asking the spectator to perform an impossible feat. Without going into the physiological side of the question, it is a matter of fairly common knowledge to every one (except the hanging committees) that, if you

take a photograph pointing your camera upward or downward, you can only get proper effect by holding the resulting print above or below the level of the eye. This is easily seen in such pictures as architecture, or most foreground landscapes, but is not quite so easily detected in the case of portraits, although it is equally true there also. The illustration facing this page is, among other points, designed to show this point. The figure was posed so that the head was considerably above the level of the camera, and the proper effect can only be got by holding the print above the eye and head level.

It may be of passing interest to say, also, that the negative was taken with an ordinary spectacle uncorrected lens of fairly long focus, and was designed as a preliminary study to illustrate the late Laureate's lines:

> " The languid light of your proud eyes
> Is wearied of the rolling hours."
>
> —" *Lady Clara Vere de Vere.*"

FRONT GROUNDS

By Abraham Bogardus

THERE are some qualifications necessary to make a good technical photographer, viz., deft fingers, quick perception and good judgment. For instruction in the necessary manipulating, read all the formulas and advice given in this publication, which, after being well shaken, are to be taken daily. Again, to make artistic photographs other qualifications are required. There must be artistic ability, native or acquired. If born with this desirable gift, well! (It cannot be bought at the doctor's shop.) Good hints are to be found within these covers—hints that will be useful. Then, with good apparatus, pure chemicals rightly used, head on straight, and considerable practice, the would-be photographer may succeed in making such work as is demanded by the times. A pretty large undertaking. Success depends on the ability of the individual. The writer must be excused if he thinks with others that there are several persons in these United States who are devoid of these qualifications, and yet they think they are photographers, when, in fact, they are only wasting plates and chemicals. The above is not written to discourage, but is intended to stimulate. When the proposed photographer thinks it is easy, with little or nothing to do, or supposes that it can be done in a slipshod manner, then he is destined to be one of the " several " spoken of. When he takes it up with the understanding that there is nice work to be done, and is willing to do it, then he is made of the right material, and will appreciate what has been written. The photographer of real ability, possessing the qualifications mentioned, will at length obtain and hold a reputation with intelligent people, if he keeps abreast of the times and is on the alert for all advances.

" *The languid light of your proud eyes*
Is wearied of the rolling hours."
—Tennyson's Lady Clara Vere de Vere

By F. C. Lambert

While there is art in photography, trying to run it into the realms of imagination has not proved a success. Style and taste are desirable, yet some things are to be avoided. Do not attempt to get so much art in your pictures that they lack common sense. Art, as some persons call it, is often overdone, making the sitter look ridiculous. You are dealing with common humanity, and not with angels. If your sitters are to look natural, do not attempt to place them in imaginary angelic attitudes, or anything outside the human. A late instance is where the operator tried to imitate one of the old masters. A young lady is pictured with eyes rolling up and a ready-to-cry expression. He called it a Madonna. It looked more like a—did you ever see a calf die?

It is not to be wondered that some professionals of mediocre attainments should make a spasmodic sensation, and for a time eclipse their superiors. This may be expected from blustering persons, or from persons of little brain, or who are educated beyond their brain capacity. Showy signs or loud advertising are depended upon to "bring grist to their mill." If they occasionally get something fairly good, they think they are the greatest photographers in America. Great photographers are as thick as blackberries in North Carolina woods.

The Midday Meal *By L. W. Barringer, Jr.*

If the photographer should succeed in getting well up on the temple of Fame, then great caution is necessary, as the upper steps are slippery with vainglory, pride, self-importance, and self-conceit. If he allows himself to be actuated by any of these, his prosperous days are ended, he will fall, and be so disabled that he will never regain his former position. The writer has been through the upper and nether mill of photography, and knows whereof he speaks.

It is a great satisfaction to see the great advance photography is making—advance in its literature, advance in execution, advance in the estimation of the intelligent public, and advance in its usefulness as it meets the world's demands.

May it continue until photography reaches the high destiny its worth entitles it to!—which, by the bye, is much higher than its present status.

THE PARADISE OF SMALL PLATES

By James Reüel Smith

(Illustrations by the Author)

NEW YORK city is so richly endowed for the small hand camera that it may readily be accepted as the amateurs' Eden.

Greater New York, stretching from the ocean to the hills of Mount Vernon, and from the Palisades to the island-dotted and Mediterranean-hued Sound beyond the white sandy shores of City Island, offers through the changing seasons a type of almost every subject in nature that can be met with in a tour of the earth.

And the city's sceneries have the advantage that they are on a miniature scale which a 4 x 5 plate can fairly well assimilate. It cannot do justice to the majesty of the Colorado, its chasms and waterfalls, but the counterparts of these to be found on the Bronx are just its size.

Snow-topped Fujisan and the Alps, or the lakes of the Swiss and the Italians are beyond its capacity; but not so the individual knolls of Astoria and Spuyten Duyvel in winter, and the ponds of Staten Island, Steinway, or Inwood in summer.

A New York City Spring
Kingsbridge Road and 184th Street

And the work-a-day photographer whose time is mostly engrossed with affairs beyond the borders of Art, need not travel to the limits of the quarter of a million acres of the new city; for it must be a very rapid worker who shall be able to exhaust in a long round of whole and half holidays the scenic and other possibilities of Manhattan Island alone, between Fifty-ninth Street and Two Hun-

dred and Twenty - third Street, to within a few blocks of any part of which, the street cars and the western branch of the Hudson River Railroad will transport one from the Battery inside of sixty minutes.

To the Crow Hill Jail, Brooklyn

" Long is the way
And hard, that out of hell leads up to light."
—Paradise Lost

Within an hour one may pass from the centre of the most bustling civilization to the aboriginal wildness of what will some day be Two Hundred and Thirteenth Street, near the Hudson, where but for the soughing of the pines, the dropping of a pin might be heard; and within the circuit of a mile all the beauties may be found in a nutshell, of forest, plain, and mountain, river, lake, and brook, and spring and waterfall.

At approximately One Hundred and Ninetieth Street and the Kingsbridge Road there is a cascade that starts from a height of two hundred feet above the level of the river. Neither Niagara nor the Yosemite has anything to fear from its rivalry, for part of the year it is nearly dry, and its two hundred feet of descent is not one sheer fall. Nevertheless, it is a doubting Thomas who will assert that it was not specially planned for small hand cameras.

Then, again, the whole process of agriculture, from which, happily, are eliminated the steam threshing machine and other unromantic concomitants of modern farming, may be portrayed from life in the proper seasons on Manhattan Island. To-day, in July, 1899, there is a flourishing corn-field at Fifth Avenue and One Hundredth Street, a quarter of a block in extent, which was cultivated and will be harvested just as in the case of a rural crop a thousand times as large.

At One Hundred and Ninetieth Street and Eleventh Avenue a much greater and more pretentious general farm is operated by a colony of Germans, and " The Angelus " in a hundred variations may be reproduced by means of no more witchery than the mere ut-

terance of a few polite words in broken English and two passes of a dark slide, or even the pressure of a finger tip.

On nearly every avenue above Ninetieth Street there are still whole blocks whose inhabitants dwell half a hundred feet in the air. On Riverside Drive, at Fifth Avenue and One Hundred and Eighteenth Street, and elsewhere, they have picturesque shanties, with now and then a goodly tree, the last of once dense woods upon the heights, where they live as secludedly and as primitively as their congeners a day's journey from the town.

A housetop's height above their fellow-citizens, they pasture their cow and tend their goats, and plow and sow, and raise their produce on Lilliputian farms, separated one from the other by fences curiously constructed with the most heterogeneous materials, living unseen and even unsuspected by many of their richer but low-down neighbors near-by. It is hard to decide whether these many little settlements were made for small cameras, or small cameras constructed for them.

The amateur, however, whose time is limited, is not obliged to ponder the question. It is sufficient that fortunately all of these and many more subjects are still within a few minutes' distance of the city's dark-rooms—so near that, if the exposures of the morning do not develop satisfactorily by the luncheon hour, there is more than time in the afternoon to profit, by the light of the forenoon's experience.

Many pages of the ANNUAL might be filled with a condensed list of good points of view and interesting objects, but with the foregoing hints in mind the explorer will find more pleasure in making his own discoveries. It may, however, be added that the trolley continuation of the Eighth Avenue cars runs directly to Woodlawn Cemetery, where an orthodox ox-team, and the only one to be found in this neighborhood, is employed, and there are methods of posing the team that leave no mournful suggestions. Also, there is at Fort Independence Avenue and the Kingsbridge Road the only beam wall to be found between Babylon and Pelham Bridge.

WITH A HAND CAMERA ON A PILGRIMAGE

By Miss Adelaide Skeel

(Illustrations by the Author)

WHEN Sure-Foot heard that his cousin Alice proposed to go on a photographic pilgrimage through New England which is mostly Massachusetts, he urged upon her his little two-and-a-half by three-and-a-quarter hand camera.

"But I am used to my five-by-eight box," she demurred, "and like my namesake in 'Wonderland,' shall feel '*curiouser and curi-*

Engraved by
Teachinor-Bartberger Eng. Co.,
Kansas City, Mo.

By Henry Wenzel, Jr.

LANDSCAPE STUDY

ouser,' and think myself growing smaller every minute, shutting up like a telescope with your tiny toy."

Sure-Foot persisted.

" David would not wear Saul's armor because he had not proved it," the girl argued, " but preferred to draw near to the Philistine, with the five smooth stones from the brook and the sling in his hand."

" David was not progressive," replied the cousin.

"He killed Goliath," Alice retorted. But she accepted the loan of " Wee-Wee."

Her friends rallied around her when it was known she was to leave her usual outfit at home. One remembered its weight, another its numerous accessories, while all recalled the girl herself, enveloped for hours under yards of black rubber cloth, emerging at intervals to gasp out, "Please wait another minute. I am getting everything ready." Wee-Wee was no misfit, and neither man, boy nor woman dreaded association with such an airy fairy concern.

" She cannot keep us waiting forever," one said. To which another added, " Nor can she make beasts of burden of us or herself with that small affair."

Old Street in Plymouth

Nevertheless, successes with a hand camera pure and simple rarely overcrowd a souvenir album. Sometimes it is too dark for a snap; sometimes the angle of the lens refuses to take in both sides of a street; sometimes in a panoramic view the distance is so minimized as to lose all beauty; sometimes buildings are so high, the box must be tiptilted to get the roofs. Hence a toppling-over effect; while, again, mechanical difficulties occur. The film rolls not on its reel, the key turns not on its pivot, and figure one, as seen in the red disk, refuses to give place to figure two; and when this last disaster overtakes the unwary, and twelve successive exposures are made on one bit of two-and-a-half by three-and-a-quarter sensitized gelatine, the result is one composite and eleven blanks.

It was through these various mischances that Alice, on her pilgrimage through Cambridge, lost the celebrated Washington elm, to get which she imperiled her life by standing in front of a trolley car; also John Harvard's statue, and the Puritan's. John Harvard, since it was Class Day, seemed indifferent, but the Puritan gazed at her

with a steadfastness that later made her failure a double mortification.


Minute Man, Lexington

The day was clouded when the Concord pilgrimage was made, hence the "Wayside," Emerson's house, "Little Women's Home," and other celebrated shrines left no images on the hand camera film, and only the invincible "Minute Man" against a gray sky came out in bold relief.

At Plymouth more successes were scored, and, although a few landmarks were lost, Plymouth Rock, under its stone canopy; Burial Hill, with the old fort's site; the National Monument to the Forefathers, besides a few historic streets and houses, redeemed the record. The day itself was perfect, and the Pilgrim Fathers could hardly have landed at a more photographic spot. The blue sky and the blue sea lend a glare which snap shots need; moreover, so distinct are the personalities of Miles Standish, John Alden, and Priscilla, the


Burial Hill, Plymouth

Puritan maiden, in this unchanged New England atmosphere, that one could not easily fog their memories.

"If only I had my view camera," Alice sighed, as the greatness of Plymouth overcame her. Alas! Wee-Wee heard her words and angrily refused to snap again, so the pilgrimage ended.

LENS NOMENCLATURE

By Dr. John Nicol

NOTHING has done so much to retard the progress of pictorial photography as the present popular method of designating photographic lenses according to the sizes of plates that they may be made to cover satisfactorily; i.e., to speak of them as a 5x7, and 8x10, a "half plate," or a "whole plate lens."

From the optician's point of view, the best lens is that which, with a given length of focus and a given aperture, will give the most perfect definition over the largest size of plate; and, with a view to show the degree of perfection to which they have attained, makers have got into the habit of introducing into their price-lists a column in which those sizes are mentioned. Ninety-nine per cent. of the buyers of lenses know less about them than about anything else connected with photography; and, not unnaturally, take it for granted, when they see, say, "10 x 8" among other features of a lens, that it is intended for that size of plate, hence the mistaken nomenclature.

A Berkshire Road, Winter
By R. E. Schouler

Camera makers, those who put on the market cameras fitted with lenses, have followed suit. The cost of lenses increases in proportion to the increase in their length of focus; and as competition is keen, it is also natural that they should adopt the optician's point of view, and supply the shortest lens that will cover the size of plate that the camera is made for, as the shorter the lens the lower the price of the camera, or the greater the profit of the dealer.

The result is that probably ninety-nine per cent. of all the lenses at present in use are little longer than the base-line of the plates on which they are employed, and some of them are even shorter, giving

to the photographs thus produced an apparent falseness of perspective that is always absurdly far from truth, and often simply ludicrous.

The principal feature of a photographic lens, from the point of view of a pictorial photographer, is its focal length, which should never be less than once and a half the length of the longest way of the plate; and twice that length is very much better, say, for a plate of 7x5, 10½ inches at least, but much better 14 inches.

Here is the sum of the matter. The optician should substitute for the size of plate the diameter of the circle of good definition. The photographer in speaking or thinking of a lens should give precedence to its focal length, to be followed by the name which designates its nature or construction; as, a fourteen-inch rectilinear, an eight-inch anastigmat, etc.; and the maker of cameras already fitted with lenses should not sacrifice utility to cost, but produce outfits capable of telling something like the truth.

THE CAMERA IN JAPAN

By Charles M. Taylor, Jr.

(Illustrations by the Author)

It may be of some little interest to readers of the International Annual, and to those planning a trip through foreign countries like Japan, China, and kindred localities, to know the experiences of some of those who have trod this country mile upon mile, with the camera as a dear and close companion. It often seems, however, that, no matter how much information or advice is given, there is a charm about the individual experiences, and they are sometimes the better school from which to learn.

My outfit for photographing subjects in a three months' tour through Japan was supposed by me to be the most " convenient " and " ever-ready, up-to-date " apparatus; but not so, for, much to my disappointment, the reality was far from the above well applied names.

Generally speaking, Japan is a much damper climate, and especially at certain seasons, than many tourists imagine, and a camera is sensitive to the variable changes of weather—heat or cold, wet or dry—and will surely suffer damage therefrom. I would therefore suggest, as the best remedy to counteract these whims of nature, a camera constructed of vulcanized rubber or aluminum in substitution for wood.

In traveling through a country where railroads and horses are seldom seen, and where the sole means of transportation are by " shanks mare " and the " jinrikisha," one must provide against the

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By A. L. Jackson

A CONVENTION PRIZE WINNER, P. A. OF A., 1899

constant exposure to variable weather The protection to body and camera, therefore, is an important problem. The body must be kept dry and warm, and the camera dry.

Mile after mile I have tramped over muddy roads, and in storms that would be a credit to the log of an "old salt." At such times baggage is carried upon the backs of coolies. Three times, when attempting to ride in a jinrikisha over such roads, I was dumped headlong into mud and water over ankle-deep, with my valued cameras rolling at my side—a pitiable sight indeed.

I would recommend that glass negatives only be used, as the most reliable. It is true their weight and bulk are somewhat against a decision in their favor, but the results will be more satisfactory than with any substitute. I captured several hundred exposures of rare and valuable subjects, and upon my return to Yokohama, at which place I had my negatives (roll-films) developed, I was surprised to find from fifty to sixty per cent. ruined by moisture. Of course, moisture will equally affect glass negatives; but glass in single cases can better be protected than a roll of film of twenty-four exposures.

View from My Room, Interior of Japan

I met a gentleman at Sendai who was sent professionally from the United States to make a series of Japanese subjects, and he told me that he had with him three cameras of the same size (5x7) and used only glass negatives. The negatives were hermetically sealed in a light-tight tin box, which in turn was placed in another box similarly sealed. He assured me that even with this precaution he had to count on a certain percentage of damaged plates caused by moisture.

Take at least two cameras of the same size, for you cannot buy with "love or money" cameras nor their belongings in the interior

of these countries. In Kioto I offered one hundred dollars for any kind of a camera, new or old, and of any size or make, and spent two days trying to purchase or find one, and finally gave up the chase broken-hearted.

Heaven save some of the highways in Japan! This cannot be said of all the roads, for some are in good condition and repair; but, when one strikes the interior, the roads seem to depend entirely upon Nature's cures, which, I assure you, are as scant as the clothing that covers some of the bodies of the natives.

Let one take a rubber cloth, made light-tight and in tent form, to snugly fit the tripod when placed open upon the floor. It will be a handy and almost necessary article, under which one can change the plate-holder and occasionally develop to test correct exposures, etc. You will not find light-tight rooms or dark corners in the inns when traveling in the interior of Japan, nor will there be handy closets or wardrobes, as in our hotels, wherein you can retreat to change your plate-holders. This tent can be made light in weight and compact in space.

Stone Lanterns at Temple, Nikko

The camera, I would suggest, should be placed in a waterproof case, and this fitted into another similarly covered and impervious to rain and dampness.

These precautions will insure to the enthusiastic tourist the best results, and the many hundreds of novel and interesting subjects will more than reward him for his trouble and expense as regards his camera outfit.

PHOTOGRAPHING FLOWERS

By James Shepard

(Illustrations by the Author)

THE present fad in flower photography is white flowers on a jet-black ground, and the enthusiastic operator glories in the striking effect that makes the flowers stand out so boldly. This may be well enough to illustrate the wonders of photography and show what an unnatural representation of a flower may be made, changing it from the slender graces of a real flower to the stiff and marbleized effect of a tombstone in outer darkness. Such pictures remind me of the resolution once introduced into the Common Council of Hartford, that the lamp-posts might be whitewashed so that they could be seen in the night. No doubt there would be a strong contrast between the white posts and the dim lights surmounting them, but a more pleasing effect might be given with better lighting and less contrast.

So in photographing flowers, all glaring contrasts should be avoided. While every perfect picture should have some jet-black and pure white, the two should be harmoniously blended, for large masses of solid black and solid white will spoil any picture. A background should always be chosen that is somewhat in contrast with the flower, but not to an excessive degree. For example, white or blue flowers should be photographed on a gray or tinted ground and never on black. A red or yellow flower may be photographed on a white ground. Of course, the exposure and developing may somewhat modify the difference between the background and the flowers.

If one desires strictly a photograph of a flower or flowers as distinguished from a photograph of a decorative piece, or a flower combined with a photograph of some other subject, the best way is to sew the flowers on a sheet of cardboard or equivalent backing of the proper shade. By a little pains the thread may be passed over the stems where it will be hidden by the leaves or other parts of the flower, and the plant or flower can be easily spread out and fastened in any desired position. They may thus be brought more nearly into one plane so as to be easily focused, while the flowers and leaves may be twisted, turned, or backed up to present the desired faces to the camera. In lieu of sewing, the flowers may be gummed or pasted on the mounting. For small plants this method of arranging permits the roots and branches as well as the flower to be properly displayed, thereby making the photograph botanically useful. The mounted flower or plant is best placed for photographing where a soft light falls on it mainly from one side so as to better bring out the delicate markings, and even if shadows, not too marked, show on the background the effect is all the more artistic. The accompanying illustra-

Japanese Rose

tion of a white Japanese rose was taken from a rose sewed upon a gray cardboard mount and photographed by a side light from a basement window.

While most flowers, either singly or collectively, can be best shown by mounting on a suitable cardboard, there are flowers that may be shown to advantage in a vase or other receptacle, and if the receptacle is transparent so as to show the flower stems a pleasing effect is given. But when a vase is used the photograph should be made with the idea of showing the flowers instead of the vase. We put flowers in a vase to make them keep, and not for the purpose of improving their appearance, and there is no reason why they should be put into a vase for photographing unless they can be arranged therein so as to show the flowers themselves to better advantage. If one desires to show a "rose without a thorn," they can hide the stem, the leaves, and the thorns in an opaque vase, while the rose itself barely shows above the mouth of the vase,; but it is better to show something besides the mere flower and vase, for the stem, the leaves, and the thorns give to the rose its beauty and poetry as much as does the rose itself. They were all made to grow together, and no photograph is either natural or artistic that does not show the characteristics of the flower. Crowded masses of flowers such as floral pieces cannot show what the flowers are. They may be photographed as decorations, but not as flowers. Unless arranged loosely so that individual flowers are distinctly separated from the others, the character of the flowers cannot be photographed. When a vase is employed in flower photography, a good background may be arranged by placing a stand near a wall, spreading a cloth over the stand as a spread, letting it extend upwardly therefrom on the wall, and then placing the vase on the stand in front of the upright portion of the cloth, so that the background both under and behind the vase may be one and the same thing. A little time and care will enable the cloth to be arranged smoothly, and it is not necessary that the cloth shall be strained.

We can avoid the question of how to arrange flowers for photo-

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INTERIOR

By H. C. Close

graphing by taking them as we find them growing in their homes, and then their own natural surrounding is a much better and more artistic background than any artificial one, like a piece of white cotton cloth tucked around their feet One writer says, "The camera must never look down, or up, on a group of flowers, as it will distort them, and will spoil the effectiveness of the design." This is true when the flowers are mounted on a card or where long straight lines show in the field; but in the absence of straight lines or planes, the camera may be tipped into any position that will best show the faces of the flowers. With small flowers that grow close to the ground it is impossible properly to photograph them without tipping the camera so as to point the lens downwardly on the flowers, and no bad effects whatever result therefrom. There is a field of invention for some one to make a special tripod for botanical work that will conveniently bring the camera into any desired position while close to the ground. With the ordinary tripod the flower photographer is often put to his wits' end to get his camera into the desired position. The camera may be tipped sufficiently to confine the view to a small area and thus avoid showing any distant field. Any objectionable sticks or leaves may be removed, but a few leaves or ferns such as nature places there to keep the flowers company are desirable. The accompanying illustration of bloodroot blossoms is from a negative by E. M. Hulbert, of

Bloodroot Blossoms

New Britain, taken in the field. It would be hard to find a better photograph of small flowers as we find them in nature. This picture proves that it would be no improvement on nature to change the background to either black or white. The picture is beautiful because it is perfectly natural. How much better it is to have a picture made striking by being natural with harmonious tints, than to make it striking by having it unnatural with coarse contrasts, like alabaster flowers on an ebony ground!

With a good lens of short focus, the flowers in the foreground may be made quite large, and at the same time show a more distant landscape in proper focus. A pond with water-lilies is a good subject for such a view. The tripod legs can be so set in the water that the camera will be brought down close to the flowers in the fore ground, from which they merge gradually into the distance. The illustration of water-lilies herewith was made in this way

Water Lilies

There is no end as to what may be done in flower photography, but the principal aim should be to represent the flowers as naturally as possible, instead of striving for unnatural effects. For botanical purposes we must also strive to show as much of their character as possible in root, branch, leaf, and flower. Some advise that light-colored flowers should be used, as the dark varieties do not photograph well, but good results can be had with dark flowers. If growing plants are taken, we generally find the darker flowers surrounded by some lighter shade, and if we pluck them for photographing we can easily

give them a lighter background, and with proper lighting and exposure good results can be obtained. It is certainly easier to photograph some flowers than it is others, but a true lover of flowers and photography will be ever ready to photograph any flower, of any color or size that ever grew, and with fairly good results, whether the flowers are light or dark, large or small.

FLASH-LIGHTS

By H. Crisp

(Illustrations by the Author)

NO trouble need be experienced by the photographer who wishes to try this means of exposure, as long as he confines himself to pictures of moderate-sized groups, rooms, etc.; but if he aims high and desires to photograph large groups or large interiors, then the difficulties thicken, and success is sometimes very dearly earned. One thing should be impressed on any aspirant for flashlight honors, and that is, never to take a picture by artificial light that can be obtained by daylight. No doubt, the fact of being able to take negatives by night and get a passable result is a step in advance, and of great utility in some cases where photographs are taken that would otherwise be impossible; but so many bad pictures are taken by night that could just as well be taken by daylight with a much better result, that a word of advice is, I think, not out of place.

A very good mixture for a flash powder which I have repeatedly used is as follows:

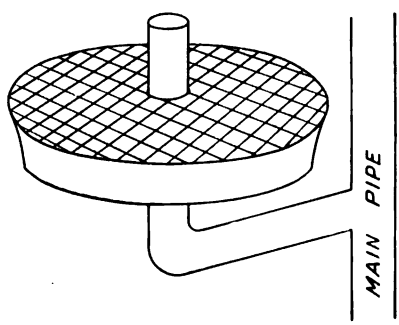
Picric acid	37.5	parts.
Chlorate of potash	50	"
Powdered magnesium	12.5	"

This must be very carefully handled, and mixed preferably on paper with a bone spoon, as the picric acid is a dangerous explosive.

Only mix small lots at a time, and at once weigh out and fold up in packages of, say, 100 grains, which stow away in a large-mouthed, stoppered bottle. The theatrical group shown was taken by means of 150 grains of this powder, which was placed, 50 grains on one tin plate and 100 grains on another, and the two exploded simultaneously, one on each side of the camera, the group being taken in a drawing-room. The powder burns very quickly, and is practically instantaneous.

This, to my mind, is the best method for an amateur to adopt, as no apparatus whatever is required for generating the light. The powders may be carried in the waistcoat pocket, and an old piece of tin or iron is always procurable on the scene of operations.

The illustration of machine shown was built for use in photographing large interiors, and has been most successfully worked. It is most portable, folding up into a space 2 feet by 7 feet by 6 inches; carries 70 lamps, which are connected throughout by metal tubing; and is backed by bright tin-plate reflectors.



Either one or more or the whole of the divisions may be used at the one time, the magnesium powder being blown through a spirit flame by compressed air from the drum here shown, which is pumped up to the necessary degree by means of a bicycle pump, and connected where marked with rubber tubing. Each separate lamp shown consists of a receptacle for the spirit, packed with cotton wool, and covered with a circular piece of wire gauze, through which the pipe conveying the magnesium is carried, and in turn con-

nected with the main air-pipes. Plates up to 22 x18 have been exposed with the light obtained by flash from this contrivance on subjects such as a large ball-room during the intervals between the figures of a quadrille, the auditorium of a theatre taken from the stage during an interval in the performance, etc., with most satisfactory results.

NOTE.—We would emphasize the warning with reference to the handling of the powder made by the formula named, as there are scarcely to be found two more active and vicious agents in combination than picric acid and chlorate of potash.—EDITOR.

SKIES IN LANDSCAPE PHOTOGRAPHY

JOSEPH F. SMITH.

WHEN we consider the attention given to skies by landscape painters, we are made to wonder why they have received so little attention at the hands of landscape photographers. Perhaps the fact, soon discovered by the early photographers, that blue and white are about equally powerful in their action on the salts of silver in the plate, has been so thoroughly ground into the users of the camera by books and teachers as to make them despair of ever being able to produce anything else than white paper skies.

But there are reformers in photography as well as in other things, and there have arisen two schools of reformers who essayed the task of teaching photographers to represent the sky by something else than white paper.

The one headed by such men as H. P. Robinson, A. Horsley Hinton and others, teach us that the best results are to be obtained by "printing in" suitable skies from separate negatives made especially for the purpose. While no one can deny the exquisite beauty of some of the results obtained by the master advocates of this method, it must be evident to all that a large number of such negatives must be made and kept on hand—a serious task to many amateurs who do creditable work, but yet are not able to take photogra-

On the Uplands *By Joseph F. Smith*

phy so seriously. It must be granted, too, that often a beautiful foreground may be obtained when it is impossible to obtain at the same time a suitable sky, and the picture may be greatly improved by a suitable "printed in" sky.

The other class, working along photo-chemical lines, have tried to eliminate the unequal chemical action of the colors of the spectrum by rendering the plates more sensitive to those at the lower end of the spectrum, or by screens to protect the plate from part of the violet and blue rays, thereby securing better equality of color value, making it possible to hold back the blue of the sky sufficiently to bring out the white and gray of the clouds.

From the second method has come an abuse quite common that is even worse than the original difficulty; viz., that of using screens of too deep color, and giving far too short exposure, so that the blue of the sky is rendered black, and the white clouds look as if pasted on the black background—a false tonality—far worse, if possible, than white paper skies. For the landscape photographer, who has not the time to make a large collection of cloud negatives for printing-in, the screen and color sensitive plate will secure better tonality if properly used. But the screen should be far less dense than those often used, and longer exposure should be given. A good slow plate having the full isochromatic effect, such as Cramer's slow isochromatic, will without a screen render clouds perfectly when present in landscapes, or, when not present, they will with proper manipulation give a true tonality that will overcome the harsh contrasts between foreground and sky.

METHOD OF USING BROMIDE PAPER

By Henry F. Raess

A GREAT deal has been written on methods of using bromide paper, and much more will undoubtedly be written on this subject, especially as papers requiring development are so much in vogue. Each writer endeavors to simplify the various steps in the manipulation, and to interest and instruct the amateur in its use. The term bromide paper is a slight misnomer, as the emulsion contains also iodide. A better name would be "bromiodide," to distinguish it from the new papers which only contain silver bromide and have a white color. The latter are far less sensitive, as they can be exposed and developed by gas or oil light, and consequently are unsuitable for making enlargements. The highly sensitive "bromide" paper also contains silver iodide, which makes it more sensitive and colors it yellow. I shall only consider the latter, the so-called "bromide" or bromiodide.

At present, in France, enlargements made from small films or plates are very popular, so why not here? Small cameras are convenient, but small pictures are not desirable. The difficulty of making enlargements has been very much reduced by the fact that several camera manufacturers have placed cheap cameras on the market for enlarging small pictures, and the amateur is no longer debarred from making his own enlargements.

But to come to the subject proper. Since bromide papers give contrast, negatives rich in detail should be chosen. The paper is placed in the printing frame in the usual way, small pieces of paper being used to gauge the exposure. If any doubt exists as to which side has the sensitive surface, it may be distinguished from the other

by its finer appearance and by the edges curling with the film inside. For the exposure, sun or artificial light may be used. The writer prefers magnesium ribbon. A short piece suffices, from one-quarter to one inch in length, held at a distance of two feet from the printing-frame. To ignite the ribbon, an alcohol lamp is used, which is kept burning in the dark-room while making a batch of prints. It is an advantage to place a pinch of common salt in the wick, as it gives more light to see by, but the light, being yellow, does not affect the paper.

In the early days of bromide paper no developer gave such good results as ferrous oxalate; but some of the newer organic developers give equally good results without the liability of iron stain. Organic developers for bromide papers should be much stronger than those for plates. The developer should be made to constant strength, and the exposure gauged accordingly. The developer may be made in bulk, and kept in small bottles filled to the neck and well corked, preferably with rubber stoppers. If corks are used, the bottles should be placed on their sides. When properly prepared, the developer will keep for many months and is ready for instant use. The keeping qualities of the developer depends very much on the purity of the chemicals, especially the sodium sulphite, a purer article being necessary for bromide paper than for plates. Care should, therefore, be taken in its selection. A good developer may be used several times if carefully bottled after using, but when it becomes very dark or gives bad tones, it should be thrown away.

Before development, the print should be placed in cold water until limp. This insures the paper lying flat and gives even development. The development should be rapid, about two or three minutes. If continued longer, the picture becomes foggy.

DEVELOPER.

Potassium carbonate	3 drams,	or	11.700	grams.
Potassium bromide	3 grains,	"	0.195	"
Sodium sulphite	7 drams,	"	27.300	"
Hydrochinone	40 grains,	"	2.600	"
Metol	10 "	"	0.650	"
Water	16 ounces,	"	480	c. c.

The water should be heated to nearly boiling, and the chemicals added in the order given. Each chemical should be dissolved before adding another. The solution should be colorless, and should be filtered, if necessary, before use or bottling. The above developer gives platinum grays and blacks.

FIXING AND HARDENING BATH.

Sodium thiosulphate	8 ounces,	or	240	grams.
Sodium sulphite	4 drams,	"	15	"
Alum, common	5 "	"	19.5	"
Acetic acid, 25 per cent	5 "	"	19	c. c.
Water	25 ounces,	"	750	c. c.

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New York

REFLECTION

By F. L. Fieger

The sodium thiosulphate and sodium sulphite should be dissolved in fifteen ounces of water, and the alum in the remainder, and the acetic acid added to it. When all are dissolved, pour the alum solution into the sodium salts solution. This fixing-bath may be used until exhausted. A small amount of acetic acid should be added occasionally to keep the bath acid. If the bath becomes neutral or alkaline, aluminium hydroxide will precipitate and the prints are likely to stain. If many prints are to be fixed, it will be found advantageous to pass them through an acid bath before fixing This bath instantly arrests development and tends to preserve the fixing bath.

ACID BATH.

Acetic acid, 25 per cent	3 drams,	or	12 c. c.
Water	16 ounces,	"	480 c. c.

After using, the acid bath is thrown away. After fixing, wash as usual, say one hour. If sepia tones are wanted, the following bath should be made:

Common alum	4 drams,	or	15.4 grams.
Sodium thiosulphate	3 ounces,	"	90 "
Water	15 "	"	450 c. c.

Dissolve the sodium thiosulphate in eight ounces of water, and the alum in the remainder. The water for both solutions should be hot. When all are dissolved, mix the two solutions. The liquid will immediately become milky in appearance, due to the precipitation of sulphur. This bath should not be filtered. As a fresh bath does not work well, to improve it some pieces of bromide or printing-out paper should be allowed to soak in it, or a little silver nitrate solution added. To use this bath, the prints should be fixed in the alum bath mentioned above, and dried. The toning-bath should be heated to about 125° F., the prints immersed, and allowed to remain until they assume the required color. It may also be used cold, but takes a long time, sometimes days, and the tones are less red. It may also be used for reducing overdeveloped prints, in which case it should be used cold. If the picture is overdeveloped, is too dense and requires reducing; if the sky needs clearing, or "pencil marks" need removing, the following three solutions should be made:

No. 1.	Sodium thiosulphate	1 ounce,	or	30 grams.
	Water	10 ounces,	"	300 c. c.
No. 2.	Potassium ferricyanide	½ ounce,	or	15 grams.
	Water	10 ounces,	"	300 c. c.
No. 3.	Potassium cyanide	1 ounce,	or	30 grams.
	Water	10 ounces,	"	300 c. c.

These solutions should be kept separately.

After fixing, wash the prints slightly in water; then apply the potassium cyanide solution, allow to act a few moments, then pour off, and wash slightly; then apply with a tuft of cotton wool a mixture of equal parts of the other two solutions, allow to act only a

moment, and wash under a stream of running water. These solutions are alternately applied until the necessary reduction has been made. Care should be taken not to allow the potassium ferricyanide mixture to act too long, otherwise a stain may result which is difficult, if not impossible of removal. After this treatment the prints should be placed in the alum fixing-bath for a few minutes, and then washed for one hour in running water. Ammonium persulphate may be substituted for the three reducing solutions mentioned above. This compound has been highly lauded as a reducing agent (photographically speaking), and it should have a great advantage over potassium ferricyanide because of its non-staining qualities. Experiments conducted by the writer, however, have not been very satisfactory, though other workers seem to have found it of great value. See *Anthony's Photographic Bulletin*, April-May, and June, 1899.

If prints are to be mounted and need trimming, they should be dried, and placed under pressure at least twelve hours before they are trimmed. To mount, soak well in water, and place the print, face down, on a plate of glass, squeegee out all superfluous water, apply the paste, and then place the print on the mount and squeegee in contact. If the prints are mounted dry, it will be found difficult to get the edges to stick properly.

Death *By Henry F. Raess*

AN ABBEY GATE-HOUSE IN LINDSEY

BY T. PERKINS, M.A., F.R.A.S.

(Illustrations by the Author)

DURING the early part of 1899, lecture engagements led me to that part of Lincolnshire which is known as Lindsey, and, as usual, my faithful companion the camera accompanied me. It was new ground to me, and I had hoped to be able to do some landscape work, for was I not going to visit the neighborhood which has produced the greatest poet of modern times? And I thought that the country which had nurtured his boyhood must have been marked with a certain quiet picturesque beauty, that would have lent itself to photographic reproduc-

tion, but in this I was doomed to disappointment. True it is that I could not visit his birthplace, Somerby, or the beach where he

"Wander'd nourishing a youth sublime
With the fairy tales of science, and the long results of Time;"

and, moreover, it must be remembered that sixty or more years of modern scientific farming has done much to change the face of the country. To use the poet's own words,

"Art and Grace are less and less,
Science grows and Beauty dwindles—roofs of slated hideousness"

have taken the place of the old thatch with its rich brown and golden moss.

The surface of the land is gently undulating, and is cut up into cultivated fields. I saw no furzy commons or heath land, or wide-stretching commons, such as those that give a charm to my own Wessex. The roads are wide, and for the most part have on one side a broad space of turf for the convenience of riders. Windmills are not uncommon features in the landscape, though I was told they are getting fewer in number every year, steam, which can always be relied on, taking the place of the uncertain wind. One miller, indeed, who owned two windmills not far apart, is said to have recently pulled down one of them on the ground that possibly there might be enough wind for one, though there was never enough for two. Those that I saw were certainly not of a picturesque type, smooth, slightly tapering, truncated cones in shape, and generally painted black. Everything about the country was far too trim for picture making. So I turned my attention to architecture.

Though Lindsey does not contain many of the celebrated parish churches of Lincolnshire, yet there are some of great interest; Barton upon Humber, with its Saxon tower, and Stow, where in 678 Egfrid built a church which became the bishopstool of the new diocese of Lindsey cut off from the huge Northumbrian see of Wilfred. Of course, the chief glory of the district is the cathedral church at Lincoln, with its three stately towers crowning the steep hill that rises above the Witham. Here may be seen the plain, massive Early Norman of the west front, the Early English of the nave, transepts, and St. Hugh's choir, and the magnificent Early Decorated of the Angel Choir or Presbytery. Here the photographer might with advantage spend many a long summer day. My visit was of far too short duration, for it was in the winter I was there, but no more perfect day for the time of year could be imagined; and as the train took me to the eastward out of the city, the Minster, lit up by the pale rosy flush of sunset, stood up against the tender blue of the cloudless sky behind it, above the thin haze that hung over the river—a very dream of loveliness.

But the great cathedral churches are known to most travelers, and are visited by thousands every year. Photographs of them are to be found in all the stationers' shops for miles round. Far more good

may be done if the photographer, whose object is not a pecuniary one, will visit the out-of-the-way country churches, and obtain negatives of interesting features which the hand of the restorer has as yet left untouched. Some such are still to be found. It is of interest to try and read the story of these humbler buildings, never written down on paper, from the walls themselves.

And in many instances, too, away from the beaten tourist track, we may find remains of the great religious houses which once abounded in England, most of them in ruins, mossy, weather-stained, picturesque. In some cases, partially converted to modern uses as dwellings and farm buildings; in others, after several centuries of neglect, carefully preserved by the present landowners. Ruins of Cistercian abbeys are frequently met with in the midst of picturesque surroundings, not because the founders had an eye for the beauties of nature, but because the spots were wild, far from human abode, and therefore singularly fitted to be the dwelling places of these hard-working monks, provided that there was a river whence they could obtain their fast day fare of fish.

Gatehouse, West Face

Lindsey could once boast of a splendid abbey, Thornton by name, which, however, was not inhabited by Benedictine or Cistercian monks, but by Canons Regular of the Order of St. Augustine. Little of the church remains; there are some traces of the foundations; two walls of the octagonal chapter-house are standing (these are of early fourteenth century work), and some small rooms adjoining it and part of the domestic buildings are incorporated in a farm house; but the one unique

feature is the Gatehouse, the largest and grandest one to be found anywhere in England. This is in an excellent state of preservation, and from its large size and the magnificence of the rooms which it contains seems to have been something more than an ordinary fortified gateway, admitting the Canons and visitors into the abbey inclosure, and capable of warding off the attacks of an enemy. It has been conjectured, not without reason, that it was used as the Abbot's residence. It stands just within the moat, and its outer or western face, though highly decorated with niches and statues, is unpierced by any windows. The moat was crossed by a drawbridge, which, however, gave place to a permanent roadway carried on a brick bridge, defended on either side by walls. This may be as late as the reign of Henry VIII. The Gatehouse itself is built of brick with stone dressings, and two flanking walls on the western face give it an appearance of being wider than it really is. The building is of three stories. The ground floor is occupied by an archway, with rooms on either side. The first floor formed the large hall, lighted by a window at the south end, and from the eastern side of this projected the oratory, lighted by a magnificent oriel window, the exterior of which is shown in the accompanying photograph of

Gatehouse from Southeast

the eastern face of the building. Access to this hall was gained by a newel staircase, the door at the bottom of which may be seen in the same picture, and the groining of the roof which is specially noteworthy. The ceiling of the hall dividing it from the chamber or chambers above has disappeared, and the roof which now protects the building is modern. There are various passages in the thickness of the walls whose position cannot well be made plain without the help

of plans. Until quite recently visitors were allowed to explore the interior of the building, but as much damage has been done by local picnic parties no one without special permission from the owner, the Earl of Yarborough, is now admitted, though no objection is made to examining and photographing the exterior. The date of the buildings may be given as the second half of the fourteenth century, the license to "crenellate," that is, to fortify, being dated 1382, though probably much of the building was done before this date. The style is Perpendicular. It remains only to say that the abbey is easily accessible by rail, as it stands about half a mile from, and within sight of, Thornton Abbey station, on the branch of the Great Central Railway that runs from Brocklesby Junction to New Holland, a village on the south side of the Humber exactly opposite to Hull.

THAT FOCUSING CLOTH

By C. H. Bothamley

THE focusing-cloth is certainly *anathema* to many photographers, especially while they are inexperienced and have not learned its many tricks, and various devices have been proposed from time to time, with a view to get rid of it altogether. Some of these devices work fairly well, but they fail to equal a good large opaque focusing cloth in two important particulars at least: They do not so completely shut off extraneous light from the eyes, which is very important when dealing with dimly lighted subjects, and they afford no protection to the camera and dark slide while the shutter is being drawn, or while waiting for the most favorable conditions after the shutter has been drawn. These are critical moments, and who can say how many plates have been saved by the much abused focusing cloth when circumstances have made it necessary to work with the camera in full sunlight? Assuming, therefore, that it cannot readily be dispensed with, let us consider the best methods of circumventing its mischievous ingenuity. Its best trick is to go off "on its own," leaving the poor camera unclothed, but unashamed; its next best is to slip forward and cover up the lens. The latter it sometimes performs in windy weather, while the exposure is being made. Both tricks can be eliminated from the programme by one and the same plan.

Ships of the Desert *By Geo. D. Pratt*

If you are working with a

lens and a cap, or with a shutter that is either on the front of the lens or is entirely inside the camera, with no strings or the like on the outside, you cannot do better than adopt the plan that I first learned from an article by H. P. Robinson, and that I used with great satisfaction for years. At a distance from one end of the focusing-cloth not less than the height of the lens above the base-board of the camera, and equidistant from the sides of the cloth, cut a round hole of such diameter that it will just slip easily over the largest lens that you use with that camera. Around the edge of this hole have well and firmly stitched a piece of good flat elastic, smaller than the circumference of the hole, in such a way that the diameter of the hole is reduced and the cloth is "gathered up" around it. The length of the piece of elastic must be such that it makes a ring that fits nicely around the mount of the smallest lens used, while it stretches sufficiently to slip over the largest lens used with the particular camera.

Jersey Shore, near Keansburgh
By G. Y. Lewis

With a focusing-cloth arranged in this way all that is necessary is to slip the aperture over the lens, and then, to make things additionally secure, fasten opposite edges of the focusing-cloth together under the camera, either with a large "safety" dress-pin, or by means of a hook and eye attached to the edges.

If, however, you use a shutter like the Thornton-Pickard, working on the front of the camera but behind the lens, the plan just described is inapplicable, because the cloth would interfere with the working of the shutter. I, therefore, devised the following plan, which I have had in use for three or four years, and which works very well, provided that the camera front, the shutter, lens fittings, etc., are quite light-tight, as they should be. It is applicable to any camera that has a sufficiently strong and rigid front.

At each of the four corners of the front, screw in a screw-eye, or screw, on a small brass plate, with a ring or half-ring attached. At each corresponding point along the end of the focusing-cloth, fasten, preferably by means of strong tape, a spring hook with a swivel, such as are used at the end of dog-chains. For a quarter plate camera you might use those that are put on the ends of the cheap steel or leather watch-guards. All you now have to do is to connect each hook with the corresponding ring on the camera front, and the focusing-cloth is secure; or the opposite edges of the cloth may be fastened beneath the camera with a pin or hook and eye if preferred.

A CHAT ABOUT LENSES

By Frederick Thomas Bennett

(Illustrations by the Author)

I AM rather surprised that photographers generally take such little interest in that most important part of the photographic outfit, the lens. They seem content so long as it covers the plate moderately well and gives a fairly sharp image. It is easily understood that professionals have but little time for experimenting, and, as a rule, they fit themselves out with a set of lenses: a portrait for its own particular work, a single for landscape and groups, and a wide-angle for close-up work. But that, of course, means money; still, where the pocket is deep, it is the best and cheapest in the end. I find most amateurs possess a quarter plate rapid rectilinear Euryscope, or doublet (under one of its many names), and I want to show what can be done with it by making the most use of it possible. The three plates illustrating the article were all taken with a quarter plate French made Euryscope sent me, from Paris, unnamed, and costing just about five dollars. The quarter plate was taken with it in the hand camera working at F8.

View at Bournemouth (reduced slightly)

The half plate was taken using the back combination only and working at F16.

The whole plate was taken with it working at F44, the lenses being mounted close together, temporarily fixed up in a cardboard mount, with just sufficient room between them for a cardboard stop.

View at Totteridge (reduced one-half scale)

It is very generally known that lenses can be altered in focus by the addition of concave and convex lenses, but it does not seem to be made the use of I should have expected, the idea being principally applied to hand cameras to bring near objects into focus where the lens is fixed for infinity.

Whole Plate (reduced one-half scale)

SHORT FOCUS LENSES

By C. M. Giles

AMATEURS of the old school, from one of whom I have had many acceptable suggestions, who used to start out, in the days of wet plates, with a wheelbarrow loaded with camera, dark-room tent, and all the other, at that time, necessary impedimenta, must look with somewhat of wonderment at the extreme craze for lightness of apparatus of to-day, and some of the consequent developments in the way of cameras, etc. The endeavor to lighten the weight and reduce the dimensions of the equipment to be taken on an arduous tramp or long bicycle trip, when every ounce seems to weigh so heavily at times, is explicable; but for the ordinary amateur's use the tendency seems to have been to push the reductions to an extreme, and the result is apt to be unsatisfactory, especially for tripod work, which, after all, is the most important. There should be weight enough to secure rigidity and stability, especially in case of windy weather.

A Winter Idyl *By R. E. Schouler*

But the effort to secure extreme compactness and lightness has necessitated the use of short-focus lenses, which are unsuitable for general work. There are times and occasions when, of course, they are absolutely indispensable, owing to the circumscribed space within which the exposure must be made; but their use should be avoided wherever possible, as the result is a forced and unnatural perspective. Who has not been disappointed, when using the average hand camera, to find that some desirable object in the middle background "shows up" small and insignificantly in the print, when in nature it had a dignity and value all its own? A longer focus lens would have brought it into different relations with the rest of the picture.

It is only after an amateur, who has been previously confined to a short-focus lens in a hand camera, has used a long-focus lens, and had occasion to compare the work of the two classes of lenses on the same object, that the difference is fully appreciated. The choice of a lens, if only one is to be owned, should be one of medium focus, say about the diagonal of the plate on which it is to be used as the shortest extreme. Apparently the most of the amateurs, through ignorance or thoughtlessness, take whatever lens happens to be in the camera of their choice, looking to all the conveniences of the camera, its lightness and compactness, but giving little or no attention to the most important feature of all—the lens. The fact is that the most of the camera buyers seem to buy a camera with a lens thrown in, so to speak, and not a lens as the one indispensable attachment of the camera, on which depends the value of the finished print.

THE EFFECTS OF FOCAL LENGTH

By Chapman Jones

IT appears to be a small matter to the beginner to pass from quarter plates and a lens of five inches focal length to half plates and a nine-inch lens, or whole plates and an eleven or twelve inch lens, but it may mean failure instead of success. It must at least require practice to get used to the larger size.

If the focal length of the lens bears the same relationship to the length and width of the plate in both cases, then exactly the same extent of subject will be included on both plates, but the picture on the larger plate will be on a proportionately larger scale. A twelve-inch lens gives exactly the same amount of subject from the same point of view on a whole plate that a six-inch lens gives on a quarter plate, but the distance between any two corresponding points on the larger plate is double what it is on the smaller.

This increase of scale necessitates a longer minimum exposure, as a blank space that may be passable and even effective on the smaller plate may be-

A Kankakee Bayou *By Geo. T. Power*

come an obtrusive fault when increased to four times its area. For the same depth of definition on the larger plate, a smaller aperture must be employed. This, again, leads to a necessary increase of exposure. Quick work becomes more difficult as the focal length of the lens and the size of the plate are increased.

A large negative or print is less brilliant than a small one, the subject and the treatment being similar in both cases. The crispness that some so much admire must be modified as the scale of the picture is increased, because it depends upon the nearness of the lights and the shadows to each other and the resulting contrast. A small negative that is good must not, therefore, be taken as a type to work to in the making of large plates.

To work a size that is much larger or smaller than what one has been accustomed to requires new experience, it is almost like beginning over again. But the same difficulty is not likely to occur in making a further change, because, when the effects of size are once practically appreciated, the photographer knows in what direction to work.

ACTION OF LIGHT ON SILVER CHLORIDE

By Romyn Hitchcock

THE discoloration of silver chloride under the action of light was observed more than a century ago, and in later years chemists have studied the chemical changes with varying results. Some have maintained that chlorine is set free; others have been unable to detect any loss in weight, which would certainly be observed if there were an appreciable escape of chlorine. The question is fundamental in its bearing upon photographic theory; for, until we know the effect of light upon the pure compound, all conclusions based upon changes in the presence of organic matter partake more or less of the nature of presumptions.

In a recent number of *Anthony's Bulletin* an article was published in which the writer treats of this subject as follows: "If we take some pure chloride of silver with a proper excess of silver nitrate, and expose it to light, we will find that it will assume a slate-blue tone and refuse to bronze; and, if it is treated with hyposulphite of soda, it will be almost entirely dissolved away. So our photographic image is not metallic chloride from the reduced chloride of silver; indeed, the only part the chloride seems to play is that of an accelerator in the formation of the image."

The conclusion thus arrived at is, perhaps, not very sound. "Almost entirely dissolved" indicates that some of the silver has become insoluble, and the proportion thereof depends upon the quantity of the original chloride which has been subjected to the action of the light. It must be recognized that the lumps or particles of

Engraved by
Western Engraving Co.,
St. Louis, Mo.

By L. V. Kupper

FROM CONVENTION PRIZE COLLECTION, P. A. OF A., 1899

silver chloride are only acted upon superficially. Break or crush them after many days, and the interior is still white. Only a very thin covering of darkened chloride is on the surface, and it cannot be doubted that this is the reason why the considerable loss in weight which silver chloride suffers under the action of light has not been generally observed. The atomic weight of silver is 108, corresponding to 35.5 of chlorine. The thin film of chloride acted upon by light is but a minute fraction of the weight of the total chloride used in the experiment, and it is still approximately four times the weight of the chlorine contained in it. Consequently, the loss of a small part of that chlorine, five or six per cent., for example, would be readily over-

Richthofen's Castle in Winter *By Wm. Ferris, Jr.*

looked, unless the investigation were conducted with the utmost accuracy and with instruments of great delicacy.

At the Toronto meeting of the American Association, 1889, I described some experiments of my own, which, although incomplete, showed that the loss of chlorine, when silver chloride is exposed to light for a considerable time and under conditions which exposed a large surface as compared with the total weight of chloride, amounted to not less than 6 per cent. The chlorine was not only determined by loss in weight, but in one experiment it was collected and weighed as silver chloride, thus entirely confirming the calculations from loss alone. (See *Amer. Chemical Journal*, vol. xi., p. 474.)

In a later contribution to this subject, I stated that "The accuracy of these results has been fully borne out by subsequent work; but

it is doubtful if even my latest experiments, which show a loss of chlorine of over 8.5 per cent., have been carried far enough to represent the final effect of the light upon this compound." (See *Amer. Chem. Journ.*, vol. xiii.)

As further confirmation of the results, I may add that the resulting compound yields a considerable proportion of silver when treated with nitric acid.

I give here the summary of results from the article last referred to:

Original weight of AgCl........................	.015959 gram.
Weight of Cl lost............................	.01393 "
Per cent of loss...............................	8.57
Silver soluble in HNO_3......................	.04205 gram.

Composition of AgCl after action of light:

Weight of discolored AgCl......................	.14566 gram.
Silver soluble in HNO_3........................	.04205 "
Per cent. of soluble silver......................	28.8

The resulting compound is probably a mixture of metallic silver and silver chloride, in the proportions which would be approximately represented by the formula $(AgCl)_2Ag$. But I am by no means certain that the action would not proceed still further, and it has been my intention and desire to continue these researches in order to determine, if possible, the final result of the long-continued action of light. I am sure that the product obtained by me does not represent the complete decomposition which light can produce, and, indeed, it would not be surprising if we should discover that light can effect the total dissociation of silver and chlorine. But my work was brought to a sudden termination by my departure from home for a long absence, and the facilities for such investigations have not since been at my command.

SOME POINTS ON MOUNTING

By H. M. Gassman

VERY often the mounting is the making of a picture. The trimming, size, shape, and perfect adhesion of the print, together with the width of border, color, thickness, and finish of the card, will modify the appearance of the finished picture more than the tyro would imagine.

The first step is to trim the print. This is best done with a print-trimmer, one of which the amateur should possess. If this is not at hand, the next best thing is to purchase a carpenter's flat steel square, sufficiently large for the largest print. Place this on the print, and trim the edge with a sharp knife, or mark the edges and trim with scissors. Cut off every fraction of an inch which in no way helps to

make the picture. This can be more easily determined by placing the print face up, and adjusting four pieces of paper or cardboard over the print until the best effect is obtained.

Prints may be mounted dry or wet. Success in dry mounting depends upon having a paper that is not inclined to curl, and a good adhesive. The latter would better be purchased, since there are several good makes on the market, and they are inexpensive. Prints mounted dry will not cause the card to warp as much as when wet.

When it is desired to mount wet, the prints are piled face to back on each other, every other one being drawn through water, and extra water drained off before putting on the pile. The whole pile is allowed to soak for about fifteen minutes until uniformly moistened.

In either case, the batch of prints to be mounted are placed face down on one another, beginning with the smallest and ending with the largest; or, better still, divide them into piles of approximately the same sized prints. To the top one apply an even coat of paste, not so thick that it will squeeze out when rolled down with a print roller. It is well to cover the face of the print with paper before rolling, and to roll from the centre outward. If the print is not quite in the centre, the card may be cut to make it so, provided it is a plain card.

Stoning Cherries *By W. F. Sahrbeck*

An attractive mat mount may be made from a thick, plain card, such as the Melton card. The size of the card should be such as to allow a margin at least one-half as wide as the print. Mark off accurately the size of the opening desired on the face of the card. With a sharp knife and a ruler cut the line marked. Then without the ruler go over the whole rectangle, always inclining the knife handle outward at the same angle, so as to cut a bevel. Cut a little deeper each time the rectangle is completed. Before the knife cuts through, the card should be placed on a smooth window-glass, so that the cut may be clear and sharp on the lower side. Any roughness on the beveled edge may be smoothed with fine sandpaper and made white

by an eraser. An opening of any shape may be cut by this method. The print is mounted on a plain card, and the whole is pasted or glued back of the beveled opening.

To prevent to some extent the bending and warping of mounted photographs, pile them on top of one another face to back as soon as the print is mounted. (This method is not applicable to sticky surface papers.) In about an hour the pile will be uniformly dampened, when the photographs can be separated for rapid drying.

HAWTHORNE'S "VILLAGE BY THE SEA"

BY WALTER SPRANGE

(Illustrations by the Author)

THE descriptive pen sketches of America's immortal romancist, Nathaniel Hawthorne, are written with such clearness that, even after the lapse of more than half a century, it is possible to trace out and recognize many of the identical spots and landmarks described with so much pathos in the imaginary retrospect, "The Village Uncle," one of Hawthorne's "Twice Told Tales."

Of the personages, although "they have all gone" when the retrospect was written, and may generally be assumed by its readers simply to have illustrated types of characters familiar to the place and period, the origin of "Susan" is vouched for in the person of the only maiden who tended store in the village at that time, and who afterward became the wife of Mr. Fuller, who owned the building occupied by Mr. Bartlett as a grocery store.

"Uncle Parker" is still recognized by some of the oldest residents in the person of an alien to the village by the name of Proctor, who came there in one of the fishing-vessels, and whose habits and traits are so vividly described, even to his sad ending when "his rheumatic bones were dashed against 'Egg Rock.'"

A typical successor to

" Uncle Parker "—who is described as a " lean old man of great height, but bent with years and twisted into an uncouth shape," " furrowed also and weatherworn "—exists in the person of a soli-

tary hermit, who has, by reason of his deformities, been the butt of thoughtless boys for many years, but whose humble garb and homely exterior conceal a generous heart and simple mind, and is introduced in the initial to this article as a living representative of Hawthorne's " Old Salt!"

" The little bridge over the brook that runs across King's Beach into the sea " has succumbed to the exigencies of the times. The brook, called Humphrey's Brook, is the dividing line between the

city of Lynn and the town of Swampscott, in Massachusetts. King's Beach forms a part of Boston's system of metropolitan parks. The little brook is now confined until it reaches the sea, but a platform

above it provides a very popular substitute for the little bridge as a roaming place for numerous successors to little "Susan."

This little platform, which forms a diminutive jetty to the sea, is also still a favorite resort at twilight from which to view the "crimson clouds fading in the West," and also at night, with "the silver moon brightening above the hill."

"The small collection of dwellings that seem to have been cast up by the sea with the rock-weeds and marine plants that it vomits after a storm" were until very recently fully represented; but they, and the "row of boat-houses" (the first building in the view "Our

Village") were all removed a year ago, and the beach cleared to form a marine park for the town of Swampscott.

"The two-story dwelling of dark and weather-beaten aspect" is still intact. This double house is one of the finest specimens of its period in the country. It was built by two Blaney brothers, who

were probably the earliest settlers in Swampscott, in 1650, and it is still occupied by their direct descendants. Of the "two grocery-stores opposite each other in the centre of the village," the basement of one is occupied as a grocery-store to-day, and is still "the haunt

of a hardy throng of fishermen." The other grocery-store was no doubt replaced by the Swampscott House about the same time that "The Village Uncle" was written, for that old hostelry is now deserted, and the building, in a very dilapidated condition, is awaiting demolition.

"The dory, the little flat-bottomed skiff" is still a popular feature of the village. In fact, the Swampscott dory is really the best known product of the place, for the "little fishing village" has gradually merged into one of the most populous and select seashore resorts on the north Atlantic coast, and it is a perfect paradise for the enterprising "camerist," as it abounds in subjects of all kinds for the development of latent talent.

SOME NOTES ON AMMONIUM PERSULPHATE

By Newton W. Emmens

(Illustrations by the Author)

NONE of the articles I have seen on ammonium persulphate as a reducer for photographic negatives have been illustrated, and, therefore, the appearance of prints made from a negative before and after treatment with the persulphate is left to the imagination of the reader. We are told, it is true, that the high lights are attacked without the shadows being affected, and that contrasts are reduced, but what the actual results

The Promenade, Brooklyn Bridge. No. 1

are would be made very much clearer if a few illustrations were shown. This is what I propose to do.

It is not every specimen of the salt in question that has a reducing action on the negative. The first sample I procured was a colorless, transparent, crystalline, slightly moist mass, which had an odor of sulphuric acid, and dissolved slowly in cold water, making a strongly

acid solution. It had no more reducing action than so much common salt, even when made up to a ten per cent. solution. The second sample was an opaque, white, granular, crystalline, dry, odorless, coarse powder, slightly deliquescent, and dissolving very readily in cold water, with a peculiar crackling noise caused by a sudden explosive evolution of gas in the interstices of the crystals. The solution was slightly acid and worked very well, the best strength to use being one per cent. If a stronger solution be employed, the action is too rapid, and there is danger of destroying all contrast in the negative, which would then yield a very flat print.

In a recent number of *Der Amateur Photographer*, Hehlheim

The Promenade, Brooklyn Bridge. No. 2

called attention to the fact that various specimens of ammonium persulphate were found to differ greatly in their action, some behaving admirably, whilst others produced no reducing effect. He suggested the addition of a few drops of sulphuric acid to the inert varieties, with the idea of starting decomposition and liberating ozone, which is considered to be the active reducing agent. I tried this with the first sample mentioned above, but with negative results; the reason being, I think, that it already had a large quantity of free sulphuric acid, as shown by its strong acid reaction with litmus, so that, having thus become thoroughly decomposed and deprived of all its ozone, the addition of still more sulphuric acid was ineffectual. The specimen

in question was tested immediately after being purchased from one of the largest wholesale photographic stock houses in New York. The second sample was obtained from a leading firm of dealers in chemicals and chemical apparatus.

In the first illustration, namely, "The Promenade, Brooklyn Bridge," it will be noticed that the buildings in the distance are somewhat indistinct, while the ropes showing against the sky are in some cases entirely obliterated, and the tops of the iron girders, together with the board walk, are almost white in color and lacking in detail.

The second illustration shows the effect of reducing the negative for five minutes in a one per cent. solution of ammonium persulphate.

The Foot of the Shaft. No. 1

The buildings in the distance show up well and are full of detail, and the ropes and board walk show up very clearly.

The third illustration, "The Foot of the Shaft," is a flash-light photograph taken three hundred feet below the surface of the ground. It will be noticed that some of the faces are very much wanting in detail, and that there is an extreme whiteness at the side of the picture. The latter feature was caused by the flash just coming within the lens field, and was unavoidable owing to the smallness of the place I had to operate in.

The fourth illustration is from the same negative after reducing for fifteen minutes in a one per cent. solution.

The fifth illustration, "The Approaching Storm," is a snap shot

The Foot of the Shaft. No. 2

taken from a ferry-boat in New York Bay, and it will be observed that the clouds hardly show up at all; but after a ten minutes' reduc-

The Approaching Storm. No. 1

tion of the negative in a one per cent. solution the clouds become plainly apparent, as may be seen by illustration No. 6.

Negatives that have become yellow from lack of proper fixing or washing may be restored to their original condition by being immersed in a two or three per cent. solution of ammonium persulphate made alkaline with ammonia. The effect of the ammonia is to avoid any reducing effect, but it does not appear to prevent the yellow stain from being removed.

I have a negative which was intensified with mercury in 1896 and had turned quite a deep yellow; yet this color was completely

The Approaching Storm. No. 2

removed by an immersion for ten hours in a two per cent. solution made alkaline with ammonia.

After reducing the negative sufficiently it is placed for a period of ten to fifteen minutes in a ten per cent. solution of hypo, which has the effect of stopping all further reducing action and at the same time removes any silver salts that may be formed by the persulphate. After this treatment it must be well washed.

I have tried the experiment of reducing an over-exposed Velox print; but the result was not at all satisfactory, as the contrasts were reduced too much and thus made the print very flat. Much better results were obtained by reducing the over-exposed print with very weak Farmer's Solution.

Also the attempt to remove the yellow color from an old albumen

print was unsuccessful, although various strengths of solution were used both with ammonia and without, the only result being that the image was almost entirely removed after a prolonged immersion in a four per cent. solution.

Great care should be taken to wash out *all* the hypo from the negative before attempting to reduce with ammonium persulphate. If this be not done, the reducing action will not be uniform, as the persulphate will first attack any hypo that may remain in the film before it acts on the silver forming the image. A mottled negative is thus produced, owing to some parts of it being more free from hypo than others, and these are the first to be reduced.

PHOTO-MICROGRAPHY FOR EVERYBODY

By W. H. Walmsley

(Illustrations by the Author)

EVERYBODY dabbles more or less in photography nowadays, at least almost everybody. There may be a few exceptions, but these do not count. In and out of season the click of the shutter is heard thoughout the land, though, it must be confessed, the amount of game bagged to that of "snapshots" fired, is disproportionately small. Failures, however, in nowise dampen the ardor of the camera fiend, who continues firing away so long as his ammunition lasts, occasionally scoring a success as an offset to his many failures. Nothing daunts him; no subject is too difficult for his omnivorous appetite to digest. From portraiture to landscape or seascape, all is food for his sustenance, photographically. What, all? Well, nearly so! One field seems to be left, an almost unexplored region to the average amateur, that of Photo-micrography. Into this field of boundless delights let us stray a moment, to see if its further exploration be at all within the possibilities of his outfit.

Of course, a microscope is necessary for the making of a true photo-micrograph, i.e., the enlargement of any object to a greater degree than five to ten diameters. Less than these powers are quite within the compass of the camera alone, and under the lower, or five diameters, may be readily produced by any form carrying a lens of short focus, a bellows, or other means of extension, and a focusing screen. The picture thus made may be termed a photo-macrograph, as a distinction from the true photo-micrograph produced by the combination of microscope and camera. An effort will be made in the following article to clearly show how this may be done, though its leading purpose is to explain to the student in natural history a simple method of making photo-micrographs of excellent quality, illustrating his work more accurately than the best drawings, without the labor and expenditure of time necessary for the production of the latter.

As already stated, a vast number of people, and especially students, have some knowledge of a photographic camera and its practical workings. The latter, also, are well acquainted with the compound microscope and its uses. But comparatively few have ever combined the two in the production of a photo-micrograph, and are fully persuaded that only the costliest and most elaborate instruments of both classes—specially constructed cameras and microscopes combining the highest attainable qualities in mechanism and optical perfection—can be successfully used for this work. Hence, we have the fact that thus far, relatively few have ever made the attempt, the supposedly necessary means being quite out of their reach.

Now, there can be no possible doubt that the making of a first-class photo-micrograph with high powers, such as the resolution of markings on the most difficult diatoms, podura scales, or the flagella of a bacillus, demands optical appliances of the highest attainable perfection both above and below stage—objective, ocular, and condenser. Only the best will suffice to reach the standard that has been set by such workers as Van Heurck, of Germany; Nelson, Pringle, and Spitta, of London, or Dr. Gray, of the Army Medical Museum, in Washington. The most perfect and elaborate outfit of apparatus, however, will not suffice to do this work of itself. Something more, and better, is needed. It is another case of "the man behind the gun." Consummate skill, unwearied patience taking no note of failures save as incentive to renewed efforts, endless work and experience, can alone manipulate such perfections in optical science and mechanism as to secure the marvelously perfect results they are capable of producing. But it is not with these that we are now dealing.

Our aim is to show that true and excellent work may be done by the average student, in whatsoever branch of natural history he may be engaged, with the ordinary microscopic and photographic apparatus at his disposal. It will be shown that the student's type of microscope used in our schools and colleges, comprising stand, with inclination to body, two objectives, one inch or three-fourths inch and one-fourth inch or one-sixth inch, two Huyghenian oculars, A and B, substage condenser of the Abbé form, and swinging mirror, is quite sufficient for the optical requirements; while any camera provided with extension bellows, or their equivalent, and a focusing screen, will serve amply well for the photographic. With these appliances it is quite possible to make photo-micrographs of a quality that the best and most costly apparatus of three decades ago could not excel. Prior to that time very few objectives were corrected for photography, and all powers below a one-fourth inch not so corrected were almost useless for that purpose, their visual and actinic foci being very far from coincident. But now even the cheapest series of student's lenses by reputable makers are virtually equally well adapted to visual or photographic work. That not very distant period was, however, prior to the days of projection and compensating oculars. If

the photo-micrographer desired to use an eyepiece rather than the objective alone, he must perforce have recourse to the Huyghenian form (admittedly imperfect), but the only one at his command. For this reason the late Col. Dr. J. J. Woodward, whose work is still world famous, dispensed with the use of eyepieces, all of his wonderful photographs having been made from the image directly projected by the objective. It was another example of "the man behind the gun." Did he live and work at the present day, he would doubtless use apochromatic lenses and projection oculars. But we are again straying from our subject of good work with ordinary apparatus within the reach of every student, and must return to it.

We are obliged, then, perforce, to be content with oculars of the Huyghenian form, since these only are furnished with students' microscopes, but, as we have seen, no others were obtainable by our predecessors in this work. Yet it must be confessed they did very well with them, as we can likewise do. So, again, with the Abbé substage condenser. It is not achromatic, nor is it intended for photographic purposes, but, if properly used, is capable of aiding in the production of very satisfactory results in that direction, as will also be shown. In short, the student may safely cast aside as groundless, all fears that good photo-micrographic work is not within his means and therefore to be no more thought of; but set about using those at hand, with the certainty of saving many hours of patient, weary labor with the pencil, and at the same time doing better and more accurate work than is possible even to the most skilled draughtsman.

Supposing, then, that we have a microscope of the student's class as described, and a camera of any form or size, hand or tripod, provided with focusing screen and extension by bellows or other means, how are we to use them in conjunction for the making of a photomicrograph? Pausing a moment to observe that of these but one, the focusing screen, is absolutely indispensable (the extension being merely convenient as a ready means of varying the magnification obtainable from either objective, with or without the oculars), we will endeavor to answer this question in as lucid a manner as possible.

The object to be photographed having been placed upon the stage, brought to centre of field, and focused in usual manner, the body of microscope is to be inclined to the horizontal position, and the mirror swung to one side, leaving under part of stage free from all obstruction. The camera (from which the lens has been previously removed), is then to be placed in conjunction with the microscope, in such manner as to permit the body of latter to enter the opening in camera front left by removal of the lens, and exactly in its centre. This is very important, and must be provided for. If the opening and tube do not coincide when camera and microscope are placed upon the same level, as a table-top, they must be made to do so by raising whichever be the lower, placing something of proper thickness, a book, for instance, beneath it for that purpose. As the tube will not fill the opening completely, all extraneous light which would

enter the camera at this point must be excluded by wrapping a fold of cotton velvet or other pliable material about the tube at its junction with camera, or by any other means which may suggest itself. It is of the first importance, however, that the joint be perfectly light-tight, since none whatever must be admitted within the camera, save image-bearing rays from the microscope alone.

Microscope and camera being now properly adjusted, the next step toward making a photograph of the object on the stage of the former instrument is to provide suitable illumination for that purpose. If daylight be determined upon, the table with apparatus arranged in the manner described should be placed close beside a window, facing either north or west if possible. A small sheet of looking-glass may be placed in such position as to reflect the light received from the sky directly upon the under side of object on the stage, or the mirror of the microscope may be used in the same manner. If properly managed, the illumination by this means is very even, soft, and satisfactory, and exposure not too greatly prolonged if the day be fair. Direct sunlight cannot be used with any degree of success, excepting by means of special condensers and other apparatus entirely foreign to our present purposes.

By far however, the best source of illumination for the student's or amateur's work, is the familiar, omnipresent coal-oil or kerosene lamp. One with a flat wick, and capable of being raised or lowered so as to bring the centre of its flame exactly into optical axis of the microscope as arranged for photography, should be chosen. If it be placed behind the microscope at a distance of about six inches, with broad side of flame parallel to the under side of the stage, an image of the object will be projected upon the focusing screen, where it may be seen, centred, and focused, the manner of doing which will be described in detail a little farther on, after some other necessary preliminaries have been noted.

It may be proper to refer here to modification of the light by means of diaphragms, as being an integral portion of the illumination now under consideration. Most microscopes of the student's class are furnished with a revolving diaphragm plate pierced with a number of openings of different sizes; others are provided with one of the iris form. In either case, the largest aperture should be used in arranging and centring the light, which must be replaced, in making the exposure, by one just large enough to admit sufficient light to distinctly resolve all details of the object, and at the same time illuminate every portion of the field alike and sufficiently. All light in excess of these requirements is harmful, and should be carefully avoided. On no account must there be a glare; a single ray more than sufficient to make the photograph is not only useless, but positively harmful.

The use of monochromatic light in all the processes of focusing and exposing will be found extremely advantageous, and its employment is most earnestly advised. Not only is the illumination more

By R. E. Schouler

A GLIMPSE OF WINTER

even, but definition of the object is sharper and clearer, and the negative better in every way, than one made by the unmodified yellowish rays from the lamp. Of course, absolute monochromatic light is out of the question with the ordinary student's apparatus, but is practically obtainable, answering every purpose, at a very slight expense. If a plane spectacle-glass of medium cobalt-blue tint be attached to the under side of the microscope stage by means of a couple of pellets of beeswax—not paraffine wax—a beautiful, soft whitish light will replace the yellow one, illuminating the field very evenly, and bringing out all details of the object in the clearest manner. This modification of the light will have no effect upon length of exposure, neither retarding nor accelerating it, as compared with that required for the same subject illuminated by direct rays from the lamp. When orthochromatic plates are used, some objects may require the use of red, yellow, or orange screens to give true color values. Others, again, having little or no contrast in their details, may be greatly improved by the use of a light yellowish green screen. All of these tints will require from six to twenty times longer exposures than the blue screen, which, as stated, does not increase them over that required for unscreened lamplight.

As to the amount or length of exposures in photo-micrography, it is utterly impossible to give any reliable data. Experience alone will enable one to determine it to any degree of certainty, as so many elements bearing upon it have to be considered. The character of illuminant, color, and opacity of object, and sensitiveness of plate have all to be taken into consideration. If diffused daylight be employed, it must be remembered that it is constantly changing in actinic power with the hour, the season of year, or whether the day be bright with sunlight or darkened by overhanging clouds. On the other hand, if the radiant be a coal-oil lamp, it never varies with a given size of wick and oil of one quality, so that this element of uncertainty is eliminated by its use. As a possible aid to the beginner, however, a detailed description of processes employed in making the photo-micrographs illustrating this article will be given, which may be useful, since they embrace quite divergent subjects and a considerable range of amplification.

A few words relative to the focusing screen also seem necessary, in pursuance of the expressed purpose to make our subject clear to everybody. The finest ground glass is much too coarse to render delicate details with sufficient sharpness to permit accurate focusing under any but the lowest powers. Numerous coarse subjects may be focused upon it with perfect results, but fine details are entirely lost, and something better must be sought if the object possesses fine details requiring amplifications greater than, say, twenty-five diameters to resolve. An excellent arrangement is to attach a thin microscopic cover glass to the centre of the focusing screen by means of Canada balsam. This will render the object at that particular point invisible to the unaided eye, but a small hand magnifier will show it

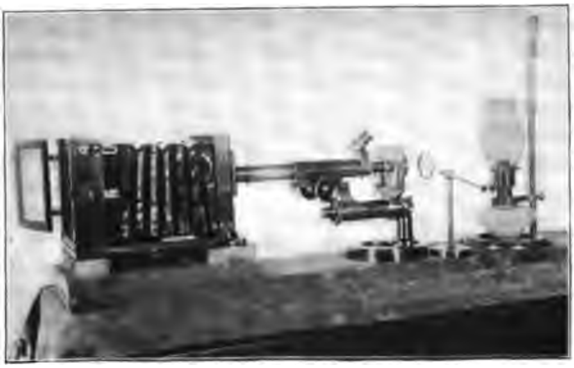
very sharply and clearly in the transparent circle. Again, if the camera has a removable focusing screen which can readily be replaced by another, the following plan, suggested by the writer many years ago, will be found very simple and easy to adopt, and at the same time entirely satisfactory. A gelatine dry plate, of same size as the focusing screen and of even thickness, is exposed for a moment to actinic light, then developed to a moderate degree of density, and fixed in the usual manner. After thorough washing until the last trace of hypo is eliminated, it is to be bleached in a bath of mercuric bichloride, washed, and dried. By substituting the plate thus prepared (gelatine side in) for the ground glass, we will have a focusing screen perfectly translucent, with an exceedingly fine surface, rendering the most delicate details of any object in a perfectly satisfactory manner. Remember, then, the ground glass is to be used, as a rule, merely for centring the object and light, and determining whether the illumination be even all over the field of view. These preliminaries accomplished, the final focusing must be done by some other means as suggested.

The size of camera is immaterial. The student may use whatever he finds at hand, though a moderate size is preferable in being more convenient to manipulate than one of large dimensions. The plate, however, should not exceed 4 x 5 inches, since the limited bellows extension of nearly all hand and view cameras will not permit a larger surface to be covered by the cone of light projected through the microscope; hence the use of larger plates would entail needless expense. Indeed, for most subjects a quarter plate (3¼ x 4¼) is amply sufficient. The illustrations accompanying this article were made on plates of that size. Either of these may be carried in plate-holders of larger dimensions by means of inside kits, which cost but a trifle. Rulings of both sizes should be made with a black pencil upon the ground side of focusing screen, care being exercised to have the lines equidistant from its exact centre. Then, the object having been arranged to come well inside these lines, we may be sure it will occupy the same position in the negative. Of course, if the camera be a 4 x 5 or smaller size, these lines will not be needed.

Having thus given at some length a general description of a photo-micrographic outfit for everybody, let us proceed to a more detailed account of its practical construction and manipulation, tracing the course of making a negative by its means from start to finish.

As already stated, if the optical axis of microscope does not coincide with centre of camera when both are standing on the same plane, it must be made to do so by raising whichever is the lower to the proper level, by placing something beneath it, for instance, a book of suitable thickness. Such an arrangement *will* answer, of course, and photo-micrographs *may* be and have been made thereby; but it is evidently a makeshift, and unsuited for regular practical work. The slightest touch at the last moment might disarrange the whole affair, and necessitate the repetition of all previous work in focusing,

etc. Manifestly both microscope and camera must be practically immovable when placed in conjunction with the view of working toward a common end. A very simple device for so doing, and one which every student can make for himself in a few moments, was used in making the photo-micrographs given herewith. The camera available at the moment was a Beck quarter plate with reversible back, hinged focusing screen, and bellows extension of about twelve inches. When stood upon a table, the centre of lens opening, was precisely six inches above its plane (the photo lens had, of course been removed). The microscope was Ross' student's "Eclipse," with rack and pinion coarse and micrometer screw for fine adjustment; two objectives, two-thirds inch and one-sixth inch, carried by a double nosepiece; two Huyghenian oculars, A and B; double mirror, mounted so as to be swung clear away from the stage, which was of large size; and provided with an iris diaphragm, and clips to hold the object. An Abbé substage condenser, also furnished with diaphragm of the iris form, completed the optical portion of the outfit, an excellent example of the class usually furnished to students at our colleges and schools. Standing upon a table with body turned down to horizontal position, the centre of eyepiece was exactly seven and a half inches above its surface, or one and a half inches higher than the camera's centre when placed upon the same level. To render these coincident, and at the same time secure each instrument firmly in its proper position to the other, was a very simple problem, quickly resolved. A board of white pine wood six inches wide by three-fourths of an inch thick, was selected from the woodpile, and a piece about four feet in length sawed off, to one end of which another section of the board, one foot long, was attached with a few light wire nails, thus furnishing a platform three-fourths of an inch high. To each end of this a narrow strip from the same plank was nailed, increasing height of platform to one and a half inches. The camera being laid thereon, and securely fastened in position by a set-screw, its centre was found to agree exactly with that of microscope standing upon the lower level of the plank's surface. Thus we have the camera immovably fixed, with the microscope free to be moved about while arranging and centring light and image upon the focusing screen, when it in turn may be clamped fast to the platform if desired. This, however, is not really needful, its weight being sufficient to prevent any undesired movement. A small coal-oil lamp, with a three-fourths of an inch wick, and constructed to carry its flame at any desired height above the table's level, with a small bull's-eye condensing lens mounted on stand with universal joint, completed the simple photomicrographic apparatus, by means of which the accompanying illustrations were made. A photograph of the outfit as it stood upon the work-table reproduced in half-tone, and showing the arrangement of its component parts quite clearly is given below, in addition to the written description.

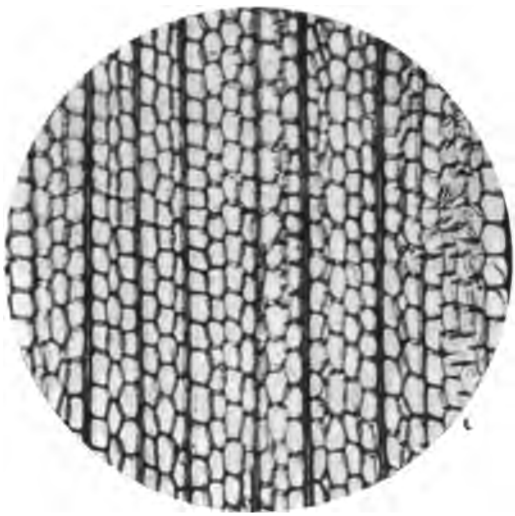

Camera and Micro

A few remarks as to plates seem to be in order before proceeding to make practical use of our improvised apparatus. What brands and what degree of sensitiveness are required to produce the best results in this line of work? A general reply may be given to both questions: "None in particular." The uniform excellence of plates furnished by all our makers of standard reputation precludes the institution of any comparison between them; while it may be safely affirmed that any plate, from the quickest "lighting special" to the slowest lantern, will yield a perfect photo-micrographic negative, if properly handled. At the same time there is ample scope for the exercise of judgment in selection of those suitable for each object in the boundless range of subjects we have to deal with, which experience only can make reasonably correct. Orthochromatic, or color correct, plates are undoubtedly the most widely useful. One eminent English authority, insists upon backed or non-halation plates, as being altogether superior to any others; in fact, indispensable to the production of perfect photo-micrographic negatives. The writer's experience has not tended to confirm this statement, but none the less they are very excellent for this purpose. As to the relative merits of fast and slow plates, it may be broadly stated that objects presenting strong contrasts or coarse details require the use of rapid plates, thinly coated; while those with delicate details and little or no contrasts in their structures are much better delineated by those of lesser speed, more thickly coated, and capable of yielding negatives of great contrasts and density at will.

The student is advised to use whatever developer he is acquainted with, provided it can be depended upon for producing good density in a correctly exposed negative, which some will not do. If he be a tyro, having all to learn, he will find the following formula (which will work perfectly with any make of plate) to be both cheap and efficient:

Sodium sulphite, granular	20 grains.
Sodium carbonate, dry	5 "
Eikonogen	5 "
Hydrochinone	10 "
Water	4 ounces.

1. *Proboscis of Blow Fly* +21



2. *Wood of European Larch —Trans. Sec.* +70

PLATE I.

Dissolve in order named, and divide into two equal portions, to one of which add the same volume of water, making a dilute solution four ounces in amount, which pour over the exposed plate. If development does not begin in a reasonable time (from thirty to sixty seconds), pour the developer back into beaker, and cover plate with the undiluted two ounces. With correct exposures, development will proceed gradually and rather slowly, with increasing density after details are out. Too rapid development—generally indicating over-exposure—must not be restrained with bromide, but by the addition of water alone; otherwise a thin, contrastless, unprintable negative may be expected. Develop until the plate is well darkened through to the back, with the image showing on that side and entirely gone on the film surface. A beautiful, clear negative, of perfect printing qualities, will be the result, if all preliminary requirements have been carefully and correctly fulfilled.

Returning from this digression on plates and development to the apparatus which is awaiting our pleasure, let us proceed to rehearse the making of the four photo-micrographs presented as illustrations of this paper. The first specimen chosen—" Proboscis of a Blow-Fly " —as seen in its microscopic mount by the unaided eye, is so large that the lowest power of the microscope must be used to embrace all of it in one field of view. A combination of the two-thirds inch objective and A ocular may afford this, but upon examining the specimen by their means we find the amplification to be so great that only a portion of it can be seen at one view. Clearly a photograph of the entire proboscis as desired cannot be made with this combination. What is to be done? Substitute a lower power for the two-thirds inch? But we have no other, and must work with the tools at our disposal. Remove the eyepiece and use the image projected by objective alone? Happy thought! Now we have the entire tongue clearly defined and well within the circle of light upon the focusing screen; so it is evidently possible to photograph it with the apparatus as it stands.

This question being settled in a satisfactory manner, the next procedure is to shorten the body of microscope by pushing in the draw-tube as far as it will go, so that the rays of light issuing therefrom may diverge at greatest possible distance from focusing screen, increasing diameter of light circle seen thereon, but in nowise changing amplification of the image. Next, the illumination must receive attention. Presuming that the mirror has already been turned aside, leaving the under part of stage free from obstruction, the Abbé condenser removed, and iris diaphragm opened to its fullest extent, the lamp is to be placed about six inches from microscope, with broad side of flame parallel to the stage, and adjusted at the height which will bring its centre directly in front of opening in the diaphragm. Now, looking at the circle of light upon focusing screen, move the lamp carefully about until illumination is seen to be perfectly even and alike all over the field. At least this is what it should be, but is

not, and the most persistent efforts fail to bring it about. A spot greatly more brilliant than the surrounding field is persistently visible in some portion of it. What is the cause? It must be found and eliminated, else a successful photograph will be impossible. Remove focusing screen, and look into the body of microscope, through which the light is passing. Ah, there it is! The bright interior reflects the light upon focusing screen, causing the flare spot which we tried in vain to avoid. Our only remedy at the time is to line body with a velvet or dead-black paper tube, easily enough made, but the necessity for doing which would be avoided by the makers of microscopes blackening the interiors of the compound bodies, which they generally neglect to do.

The object presenting strong color contrasts, ranging from very dark brown to faint yellow, a blue glass screen is selected and attached to under part of stage as described. The field as seen on focusing screen is now found to be quite evenly illuminated with a slightly bluish white light, but evidently in excess of requirements, as the more delicate details of object are somewhat obscured by its volume. Closing the diaphragm gradually until all details are shown equally well defined upon a field fully lighted, we may feel assured that the important process of illumination has been properly accomplished. Thus far all arrangements of centring object, lighting, and focusing have been done by the unaided eye and coarse ground surface of the screen, but final adjustment of focus must be accomplished by means of a hand magnifier applied to the transparent circle in centre of screen, while the fine adjustment screw of microscope is being manipulated. The whole apparatus is so short that every portion of it may be reached by the hand while the eye is occupied in viewing the object upon the screen. It is to be observed that source of light is the lamp alone. The bull's-eye condenser is rarely used with very low powers when the ocular is omitted.

Everything being in readiness for the final operation of exposing, we may now proceed to that. A rapid orthochromatic plate as best suited to the subject (already chosen and placed in plate holder) is attached carefully to the microscope, and a blackened card between stage and radiant prevents any light from reaching the object. The slide of plate-holder is withdrawn, and, after a moment's waiting to allow for subsidence of all tremor, the card is lifted, and exposure begins. How long shall it last? This question, as in all similar cases, can be answered by experience alone; but it is well to remember that over-exposure is better than the contrary, and that almost all plates have considerable latitude in this direction, which careful development may take advantage of. In this case, one minute was adjudged to be about right, and the result proved its correctness, as the negative is a fine one. Development having already been treated of rather fully, it is unnecessary to refer to it again in this connection.

A very important point in photo-micrography, and one too frequently overlooked, is the measurement and recording of the amplifi-

cation used in making every exposure. A photograph, or its reproduction, merely labeled "highly magnified," loses very greatly in value as an educator. The student should commence at the outstart by carefully ascertaining the magnification of each negative made, and recording same in a note-book. It is very readily done with sufficient exactness for all practical purposes, as we will now proceed to demonstrate by measuring the amplification used in the present instance. For this purpose, a stage micrometer having lines ruled to one-hundredth and one-thousandth of an inch is necessary. We remove the slide just photographed from stage of microscope, replacing it with the micrometer, the rulings of which will be seen projected upon the screen where they are to be sharply focused. For so low a power, the one-hundredth only are used; above +200, the one-thousandth spacings will be found the more convenient. Place one point of a pair of dividers in the centre of a line, and the other in that of the adjacent or next one; then, applying them to a pocket or other rule divided into tenths of an inch, note the space upon it covered by them from point to point. In this instance, it will be found to exceed two one-tenth divisions by a very small fraction, showing the enlargement to be +21, since it is evident that, if lines ruled one-hundredth of an inch apart be separated by magnifying to the distance of one-tenth of an inch, they must be enlarged ten times in all directions, or ten diameters, as usually termed. If the enlargement be sufficient to cover two of the one-tenth divisions on scale, it is manifest that twenty diameters indicates the amount of amplification. This method of ascertaining the magnifying power is applicable to all possible optical combinations, and its use is urged upon the student in his photo-micrographic work.

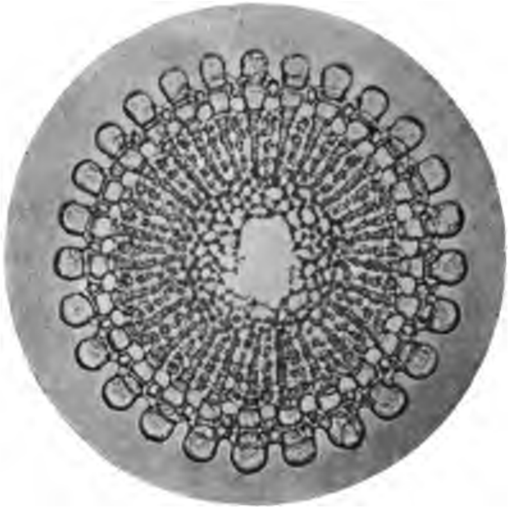
The next object—A Cross Section of Wood—requires quite different treatment from the first, though made with same objective. In order to give details of the structure sufficiently large to be readily seen, much greater amplification is necessary. This might be obtained by increasing length of bellows; if it were possible so to do with our camera; but as it is not, we must have recourse to an eyepiece. The microscope tube is therefore extended to its full length (for which the objective is corrected), the lining of velvet or paper withdrawn, and ocular inserted. The camera should also be removed, but microscope and lamp are not to be touched, being left as they stood in making the first negative. In this position the object may be seen as in ordinary work with the instrument, and the best field for photographing selected. The blue screen is used as before, and diaphragm left well opened. Upon replacing camera, the entire circle of light cast upon screen will be found covered by object, without any marginal space of light as before. The illumination will also be quite dim compared with the former, owing to retardation of light by the ocular. If a small bull's-eye condensing lens be placed between stage and lamp, as shown in illustration, its brilliancy and volume are greatly increased, but care must be taken to get it into the exact posi-

tion to insure equal illumination over the entire field. Finally, the diaphragm must be gradually closed as before until the finest definition coupled with sufficient light be found. The object being almost colorless—very delicate yellowish tint—a thickly coated plate of moderate sensitiveness is selected and exposed forty-five seconds, which on development is found to be correct. Measurement with micrometer shows the amplification to be +70.

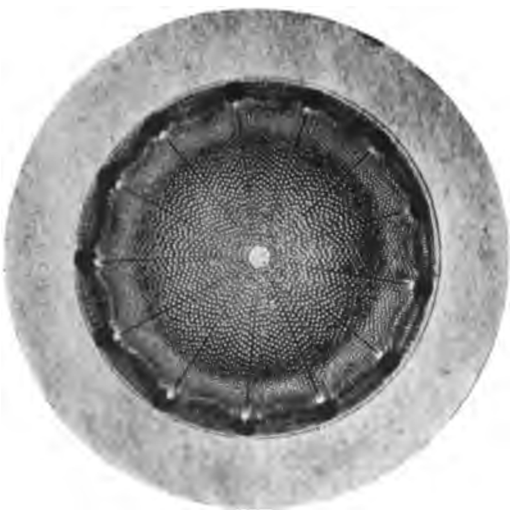
The subject selected for the third illustration, to be made by the one-sixth inch objective, without ocular, is a transverse section of a very minute Echinus Spine; colorless and exceedingly transparent. All operations of arranging, lighting, and focusing are precisely the same as with No. 1, with addition of bull's-eye condenser for increasing illumination necessary to avoid inordinate length of exposure with the higher power. A thinly coated, highly sensitive portrait plate is selected and exposed forty seconds, yielding a surprisingly strong negative, under the circumstances, the amplification of which is found to be +90.

The fourth and last photograph was made with the highest power possible to our apparatus as it stands (a combination of the one-sixth inch objective and B ocular). These might have been used with the same lighting as in No. 2, had it not been determined to try the Abbé condenser as illuminator, notwithstanding the assertion by all authorities of its total unfitness for the purpose. Bearing in mind, however, the fact that most students' microscopes are furnished with a condenser of that form, and knowing that acceptable work can be done by its aid, it was thought proper to present with the present article an illustration thus made. The condenser having been inserted in substage ring, the lamp—with edge of flame turned toward it, was moved about ten inches distant, and bull's-eye condenser placed between the two in such position as to parallelize the light rays. All subsequent operations of illuminating, centring, and focusing the object were identical with those in No. 2. The subject selected for this final test of the apparatus was a Diatom of discoid form, the beautiful Aulacodiscus Oreganus, quite highly colored and rather opaque, like most other species of this family. A thickly coated plate of moderate speed, the same as No. 2, was used, to which an exposure of five minutes was given, the amplification being 315 diameters. The resulting negative yielded a print from which the reproduction was made, the merits of which must be left to the judgment of our readers.

At the outset of this article, it was intended to include practical instructions for making photo-macrographs by means of the camera alone. Also, descriptions of certain printing methods, which the writer has found to yield better results, with less labor and uncertainty, than any others with which he is acquainted. But it has already grown to such inordinate length as to forbid any further extension. Perhaps at some future time they may be given to the ANNUAL's host of readers.



1. *Echinus Spine—Trans. Sec.* +90



2. *Aulacodiscus Oreganus* +315

Plate II.

Description of Photo-Micrographs.

PLATE I.

1.—Proboscis of Blow-Fly.

Colors of Object—Very dark brown to lighter shades, with yellow varying in density.
Screen Used—Cobalt blue.
Objective—Ross' student's two-thirds inch.
Ocular—None.
Condenser—None.
Plate—Rapid orthochromatic.
Light—Coal-oil lamp, broad side of flame.
Exposure—60 seconds.
Developer—Eiko-hydro, as per formula herewith.
Amplification—21 diameters.

2.—Wood of European Larch—Transverse Section.

Color of Object—Very pale yellow.
Screen Used—Cobalt blue.
Objective—Ross' student's two-thirds inch.
Ocular—Huyghenian, B, 1½ inch.
Condenser—None.
Plate—Landscape, moderate speed.
Light—Coal-oil lamp, broad side of flame, and bull's-eye.
Exposure—45 seconds.
Developer—Eiko-hydro.
Amplification—70 diameters.

PLATE II.

1.—Spine of an Echinus—Transverse Section.

Color of Object—None; quite hyaline.
Screen Used—Cobalt blue.
Objective—Ross' student's one-sixth inch.
Ocular—None.
Condenser—None.
Plate—Portrait, very rapid.
Light—Coal-oil lamp, broad side of flame, and bull's-eye.
Exposure—40 seconds.
Developer—Eiko-hydro.
Amplification—90 diameters.

2.—Aulacodiscus Oreganus—Discoid Diatom.

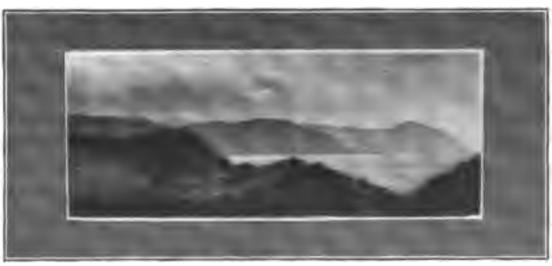
Color of Object—Dark bluish gray, rather opaque.
Screen Used—Cobalt blue.

Objective—Ross' student's one-sixth inch.
Ocular—Huyghenian, B, 1½ inch.
Condenser—Abbé substage.
Plate—Landscape, moderate speed.
Light—Coal-oil lamp, edge of flame, and bull's-eye.
Exposure—5 minutes.
Developer—Eiko-hydro, as per formula given herewith.
Amplification—315 diameters.

HAND CAMERA NOTES

By Martin J. Harding

IN the second volume of our Annual, I was privileged to give a few notes on this subject, and, as a decade has since passed by, it may be worth while to go over the ground, comparing our present position, and all the advances and improvements that have been made, with that of ten years ago. At that time the evolution of the magazine form of camera was in so embryonic a stage that I leaned very much to the simple camera, with separate double backs, as being by far the safest instrument to use, with a minimum risk of anything sticking or going wrong. But in the interval so many methods of changing plates and films have been perfected that there is now no difficulty in selecting a really reliable magazine camera, the difficulty rather lying in making a final choice out of the many good things now on the market. Where a lot of work is in view, it is most convenient to possess a camera carrying a large number of exposures, and, although not having quite discarded my baby camera (previously described), I have, for the last few years been also using, most successfully, a camera carrying forty cut films, which I find to be a most reliable and satisfactory instrument. I still adhere to lantern-plate size, and even smaller, as being so eminently suited for enlarging in an ordinary lantern with 4-inch condensers; but, instead of enlarging directly on bromide paper, my practice latterly has been, after first making a lantern slide by contact, to use the slide in the lantern for making an enlarged negative. This method has the advantage of allowing any desired modification in the gradations of the original



Sandhills by the Sea *By Martin J. Harding*

negative, besides giving an unlimited choice in our printing medium. Fine pictorial effects are thus readily obtained up to 15 x 12, or even larger sizes. The wisdom of trimming down from the original negative is an important matter, and I beg to submit the accompanying subject as a fair example of the result of careful cutting away of excessive material.

Notwithstanding the multitude of new developing agents, there is still nothing for all-around work to beat our good old friend pyro, although, in special cases of weak light or very rapid exposures, a metol-pyro developer may be used with some advantage. The bulk of my exposures are still made at not more than one-fifteenth second, with the lens at F 16, and a plate or film of medium rapidity. Great strides have been made in the speed of plates, and the quality of the most rapid has been vastly improved. Still, great care is required in their development, and the latitude they allow in over-exposure is, of course, much less than of the medium speeds, which are amply quick for general purposes.

A really valuable reducer of over-density has lately been introduced, for in a careful use of persulphate of ammonium, it is certain that hand camera workers, who so often get hard contrasts, will find a complete cure for this common defect. Over-density is readily cleared away, without any reduction of the shadows, care being taken to use a weak solution under complete control, followed at once by a ten per cent. bath of sodium sulphite, to stop its action, and a final fixing in fresh hypo.

In printing materials, print out platinum paper still holds its own for simplicity and permanency, while for warmer tones the new self-toned P. O. P., requiring only to be fixed in weak hypo, gives most pleasing results. If ordinary P. O. P. is used for gold toning, the preliminary washing may be safely dispensed with and much time saved by adding about thirty grains of sodium chloride to each eight ounces of toning bath, and putting the dry prints therein. For enlargements there is nothing to equal a good rough surface for pictorial work, and even in making direct prints from my small negatives I have long ago learned to discard the usual glazed surface in favor of the beautiful matt surface papers, a more familiar acquaintance with which I venture to commend to our American cousins.

OZOTYPE

By T. Manly

IT is to be regretted that the beautiful and permanent photographic printing process by means of sensitive carbon tissues, invented by Mr. Swan, in 1864, has not attained the popularity among amateur workers that its charming results would seem to warrant. This may be accounted for by the following facts: that

Reproduced from Ozotype by the Author

there is no visible image during the progress of printing; that the pigmented gelatine picture is reversed in regard to right and left, unless a second process is carried out; and that the sensitive gelatine tissue changes its character every day it is kept.

In ozotype, it is the paper or support that is to hold the picture which is rendered sensitive to light; and the image prints out on such a surface in a pleasant brown color, much more conspicuously than on a ferric or platinum paper, and next in point of visibility to silver chloride, and the paper in its sensitive condition will keep good for at least two months. A solution of potassium bichromate and a manganous salt is used to produce the light-sensitive surface.

After exposure, the print is simply washed in water, when it will keep indefinitely. Here is a distinct advantage over the carbon process. The initial print after being washed can be kept for any length of time until it is convenient to pigment them. The pigmenting operation is very simple. Insensitive carbon tissue (a special tissue for the process is being prepared in England) is immersed for about one minute in the following solution:

Glacial acetic acid	4 to 6 parts.
Hydrochinone	1 " 2 "
Water	1,000 "

The print is then brought in contact with the carbon tissue under the surface of the solution, and both are drawn out clinging together, and squeegeed on a flat surface. They are then surface-dried between blotting papers and hung up to dry. When dry or nearly so, the print with its adherent carbon tissue is placed in cold water for about half an hour, when it is ready for development, which is performed by immersing it in water at a temperature of 104° F., when the backing of the tissue can be removed, and the soluble gelatine washed away practically in the same manner as in the present carbon process. Patents for the use of this process have been granted in the United States and Canada.

LOCAL DEVELOPMENT

By Osborne I. Yellott

(Illustrations by the Author)

FROM the examples of modern photography which the general public has an opportunity of examining, it would seem that local development is a branch of the art but little understood, or, if thoroughly understood, but little practiced. Hours are spent over refractory negatives from which it is hoped to get prints approximating a realization of the artist's conception of his subject, and every time a print has to be made the same ordeal has to be gone through with. In fact, many writers claim that the negative itself is but the beginning of the picture that is to be, and that all depends upon the printing. While much of this is true, it

Child Study

is nevertheless a fact that a great deal of the trouble and uncertainty of artistic photographic printing can be avoided by the expenditure of a little more time over the developing tray. A few writers have touched upon this subject.

We are told, for instance, that in developing a plate from which we hope eventually to print both landscape and clouds, we should restrain the sky by the use of a solution of bromide of potassium locally applied—an operation very simple in theory, but very uncertain and difficult in practice. In many portrait studies, again, we are told to develop for the shadows, and subsequently reduce the highest

lights to printing density by the use of a reducer—another simple operation from a theoretical standpoint, but tiresome and uncertain when we get at it. If we desire to centre our higher lights and render the less important portions in a lower tone, we are told to sun the latter down every time we make a print.

Now, all of these results, and many more, can be obtained by local development, and when the work is once done it is done for all time. But they cannot be accomplished in any three or four minute development. The writer has on occasion taken a full hour to develop a single plate; but with that negative he can print in platinotype, silver, bromide, gum bichromate, carbon, or any other process, besides all of which, he can enlarge it to any desired extent, or reduce it to lantern slide size and subsequently throw it on a ten-foot screen, with the absolute assurance that in every phase it will be characterized by the effect which he aimed at in development.

The possibilities of the method are more complex by far than its practice, the latter being simple and reasonably certain after a very few failures, they being necessary to teach one what to avoid rather than what to do.

A double quantity of strong developer is first to be made up. One portion is to remain in concentrated form, another is to be diluted with its bulk of water, and the third diluted with from six to twelve times its volume of water. A fine brush and a supply of absorbent cotton complete the outfit.

Now let us take a picture of a familiar type, and see what can be done with it. For instance, take Wilkinson's rayfiltergraph, opposite page 136, in last year's ANNUAL. It was a Convention Prize Winner, and may not, therefore, be susceptible of any improvement, but we can try. Here we have a landscape with clouds, an uninteresting foreground, a straight road with well-defined wagon-tracks, a range of hills or rocks in the middle distance, and mountains in the far distance, the whole lit by very bright, almost noonday sun. The plate

was developed for the clouds. It assuredly was not developed for the foreground or middle distance, nor was it exposed for either.

Instead of developing this plate in the ordinary full-strength or even half-strength developer, we shall place it in our very weak bath. In a minute or two the image will begin to come out, gaining density slowly. After about five minutes of this kind of development, during which the sky is gaining but a tithe of the density it would gain in the normal developer in that time, we dip a wad of absorbent cotton in the half-strength solution, and carefully take it up and down the road, right through horse, vehicle, and occupant. This is repeated several times, giving the near end of the road less forcing than that nearer the middle of the picture. Then put the plate back in the weak developer. Now we take our brush, dip it in the concentrated solution, and paint with it the horse and vehicle, being careful to keep within their outlines, placing the plate back in the weak solution from time to time, or rinsing and draining if necessary to keep the developer from spreading. Next take the wad of absorbent cotton wet with the half strength solution, and run it boldly over the central portion of the picture, including the hills in the middle distance, and later the mountains behind them, using the brush with the latter. Continue this treatment cautiously until the plate has almost reached its proper printing density, centring the highest tones somewhat, but carrying the forced development to the edges of the plate, though in a less degree, and replacing in the weak developer frequently, to avoid spotting and streaking.

Next pour off the weak solution, and then flood the plate for a few seconds with the stronger, or even the strongest, if it is still lacking in density. The sky will now come up rapidly. As soon as it is dense enough to print of the desired tone, pour off the developer, rinse, and fix.

The print will now show a genuine sunlit landscape, a horse and vehicle with some degree of definition in them, a crisp, bright stretch of lowland, atmosphere between the vehicle and hills in the middle distance, more atmosphere between the latter and the mountains, and, finally, a sky of good tone, with just as good cloud forms, but far less unnatural contrasts. The latter feature would not, however, be so striking, and the picture would therefore probably not be a " Convention Prize Winner."

Once the principle of local development is caught and a fair degree of skill acquired in its exercise, the photographer will see opened up before him possibilities innumerable. With most plates a dilute development, with a touch of the stronger developer now and then, will be all that is necessary. All the method needs is patience, judgment, and a fair degree of manual skill.

ODDS AND ENDS

BY HENRY WENZEL, JR.

EVERY photographic worker is bound to be an inventor. Necessities arise demanding new devices, new formulas, new methods. Marketed devices and standard formulas must give way to special devices, and formulas adapted to special needs.

A HANDY ADJUNCT.

A very handy adjunct to an outfit is a mirror, in which to see reflected, right side up, the inverted image seen on the focusing screen. How to carry the mirror without fear of breakage is the question. A moment's thought will suffice to answer it. Remove the film from an old negative of the full size of your focusing screen and thoroughly clean the glass. Have this glass silvered, and when it is returned to you in the form of a mirror, place it in one of your holders, into which, of course, it will fit as snugly as a fresh dry-plate. Note carefully the number of the compartment into which it is inserted. Other uses for the mirror I may leave unsuggested, as they will readily be surmised.

ORTO-METOL.

So many of those to whom I have given the formula for the pyrometol developer I employ have objected to it because "it stains the fingers so," that I have combined Ortol and Metol with a view to obtaining a stainless developer of good keeping qualities, giving pyro-metol effects. My formula for the same in two solutions is as follows:

A.

Metol	120	grains.
Metabisulphite of potassium	60	"
Ortol	180	"
Bromide of potassium	50 to 100	"
Hypo	10	"
Water	47	ounces.

B

Sodium sulphite, crystals	4½	ounces.
Carbonate of potassium	1½	"
Water	47	"

Or by hydrometer:

Sodium sulphite solution, test 40°	27	ounces.
Sodium carbonate solution, test 30°	20	"

For use, take:

A	7	ounces.
B	8	"

*Engraved by
Williamson-Haffner Eng. Co.,
Denver, Colo.*

By H. Wenzel, Jr.

EAST RIVER AND BROOKLYN BRIDGES, NEW YORK

To make up the above in one solution, take:

Metol	12 grains.
Metabisulphite of potassium	6 "
Ortol	18 "
Sulphite of sodium crystals	½ ounce.
Carbonate of potassium	80 grains.
Bromide of potassium	5 to 10 "
Hypo	1 "
Water	10 ounces.

"SOMETHING TO GO BY."

With all deference to those who advise beginners to learn by experiment the correct exposure for various subjects under various

H. Wenzel, Jr.

circumstances, and to avoid depending upon an exposure meter, prophesying that, once dependent upon a meter, one can never be independent of it, I state that actual experience in use of the Wynne meter has proved otherwise in every case that has come under my observation wherein the meter was intelligently employed. It so often happens that I leave my meter at home, that, without consulting it, from memory only and based entirely upon knowledge gained from the use of the meter, I write the following:

When you have forgotten your exposure-meter or have left your exposure-table at home, it is of advantage to have something better than a mere guess to go by. If you will but remember that with

stop F32 one-half second will be a safe exposure for an average landscape in bright sunlight during the summer months, any time between, say, 9 a.m. and 4 p.m., with a little thought you will be able to figure out the exposure for any subject in any light, and with any diaphragm close enough to insure against gross errors of judgment. Under the same conditions as above, double the above exposures for mid-autumn, triple them for early winter, and quadruple them for midwinter. Double the exposures required in bright sunlight if bright diffused light prevails; triple them if it is cloudy; quadruple them for objects in shadow or if the sky be heavily overcast. If in addition to this you will remember that dark-colored objects near the camera require at least double the exposure for an average landscape, and that an open landscape having a bright foreground requires but half the exposure of the average landscape with its mixed foreground of light and shade, you may leave your exposure-table at home indefinitely and never miss it.

A HINT TO BEGINNERS

By Frederic G. P. Benson

(Illustrations by the Author)

ONE of the most prevalent temptations which beset beginners in Photography, and which is very prejudicial to sound and rapid progress, at any rate in the more purely technical processes, is the continual shifting about from one developer to another, and never-ending, and usually unsuccessful, experiments with different toning baths. Most of the published formulas are reliable, but in no case should they be considered any more than forming a starting-point, as it were, from which each worker can commence his own trials, and as providing a convenient form of keeping the various chemicals in a state ready for use. I propose to deal with only one subject, that of development, and hope to show the variations of which any standard formulas, in which the solutions are made up for use in equal parts, is capable. Ten per cent. solutions have many advocates, and where much experimental work is done they are undoubtedly very handy; but, after considerable experience with both systems, I have come to the conclusion that "equal solution" formulas are the best for regular every-day work. I will suppose that we have the stock solutions made up, and, as is customary, call the Developer proper A, and the accelerator B. Equal parts of these will give a developer of full strength, which should hardly ever be applied to a plate of any kind, and under no circumstances where there is the slightest doubt as to the correctness of the exposures. With a suitably exposed plate and

full strength solutions, the negative certainly comes up quick and strong, and the result is eminently satisfactory; but, considering the very few instances when one can be absolutely sure of an exposure, it behooves us to be very sparing in strong solutions at the commencement of our developments.

A, 1; B, ½; water, ½.

This is a good proportion with which to commence all ordinary work where a negative of good density is required, and in many cases development can be concluded without any addition. If, however, progress is slow after the high lights have appeared, the remainder of the alkali can be added, and a good result obtained.

Archbishop's Palace, York

For under-exposed plates the proportions would be: A, ¼; B, 1; water, ¾. This will provide a means of getting all the detail possible, without any danger of undue density, owing to the long time which an under-timed plate takes to develop. If, as is sometimes the case, the negative appears thin after all the detail has been coaxed out, a second bath of full strength solutions will work wonders, and produce a much more harmonious result than if the plate had been merely treated to one bath. Over-exposure, on the other hand, calls for more A and less B, say, A, 1; B, ¼; water, ¾. If the image appears at all quickly, the plate should be dropped into another dish containing a weak solution of bromide, say one grain to the ounce, and left for about a minute, and then returned to the developing solution. In most cases the picture will come up nice and steady, density and detail being obtained simultaneously. In all cases where doubt exists about the exposure, it is advisable to begin with a developer weak in both constituents, say, A, ½; B, ½; water, 1. Development

The Archbishop's Palace, Bishopsthorpe, York

will then be slow and perfectly under control, so that addition may be made as need arises to secure detail or density. For portraits and similar subjects this half strength developer will usually give sufficient density without further addition.

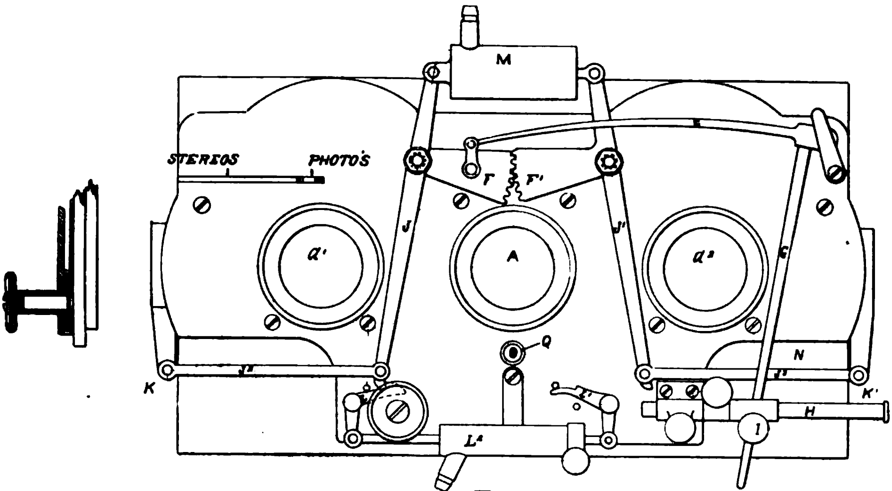
Such are the principal modifications which can be made with any formula, and, by sticking to one until he is familiar with the effect produced by the various proportions, the beginner will have much better chance of obtaining proficiency than if he chops and changes about, trying any and every new developer that is placed on the market. Of course, after a certain amount of skill has been acquired, it does not follow that no other formula or chemical should be used. I do not suggest that we should be slaves to any one pet formula, but rather that we should so accustom ourselves to it that it becomes our handmaid to do our bidding. All the developers on the market have some characteristic rendering them specially useful for certain work, and it would be foolish were we not to utilize them, when from the experience gained by the careful and continuous use of one formula, we are able to fully appreciate whatever advantages the newer substances may possess.

A NOVEL COMBINATION SHUTTER

BY ACTINIC

AN important element in photography, both as regards convenience in operating and control over results, is the shutter. Although there are innumerable shutters on the market, one recently designed and made by Mr. Vernon Royle, the well-known amateur, possesses some novel features, and is, in many ways, a model shutter—simple, easily handled, and permitting of great accuracy in the arrangement of the diaphragm and regulation of the exposure.

The chief and most distinctive feature of this shutter is that it provides, within the limits of one device, for both single and stereoscopic lenses. These lenses are always in position ready for use, and can be thrown into action by a simple and quickly made adjustment. The construction of the shutter will be readily understood by reference to Figs. 1 and 2. A, Fig. 1, shows the single lens, centrally located

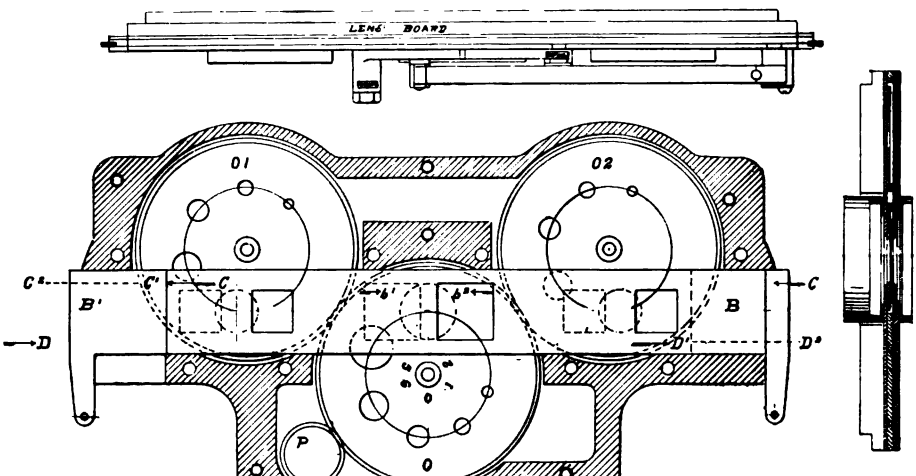


—Fig 1—

in the usual manner; *a1* and *a2* are the stereoscopic lenses. Immediately back of the front lens cells is a flat plate, having three circular openings, of the same dimensions as the orifices of the lenses, and so arranged that, when the central opening is opposite the single lens, both stereoscopic lenses will be covered. By a single movement, this slide can be drawn to one side, covering the orifice of the central lens and bringing two openings opposite the stereoscopic lenses. Immediately back of this slide are the blades, B and B1, of the shutter, the

opening of which exposes the plate. These blades are two in number, and are shown in Fig. 2. Each blade has three square openings, of sufficient size to equal the diameter of the largest diaphragm opening used, and each has a movement equal to this diameter, in opposite directions. They thus, when in motion, pass each other, the two square openings being exactly opposite each other when the movement is half completed, opening the lens and exposing the plate, the continuation of the movement closing the opening in the diaphragm, which is entirely shut when the blades have completed their movement.

The blades in Fig. 1 are shown in normal position, entirely closing the lenses. Let us suppose the slide back of the central lens has been drawn away and an exposure is to be made. *b1* shows the open square in B, while *b2* shows the corresponding opening in B1. The shutter having been touched off in a manner which we will presently describe, the slide B moves across in the direction of the arrow, C, until the end of the slide *c1* reaches *c2*. At the same instant of time, slide B1 moves in the opposite direction, from D1 to D2. It will be



-Fig. 2-

seen that, in the course of this movement, squares *b1* and b*2* will be carried past each other, opening and closing the lens in a single continuous movement.

This has important advantages, and contains the elements of great speed and certainty of action. In all shutters which open and close in two movements, there must, of necessity, be a moment when the blades are at rest; a certain amount of inertia to be overcome while the lens is open; and while it is true that, by mechanical treat-

ment, this dwell can be greatly reduced, it still exists, and such a shutter can never reach top speed. Further than this, in the shutter we are describing, the use of two blades moving in opposite directions reduces by one-half the time required for a single blade, moving at like speed, to open and close the orifice of the lens.

The actuating apparatus of these blades is readily adjustable so that longer or shorter exposures can be made, is very strong, and is not liable to get out of order. The chief element in it is a flat spring, E, Fig. 1, the position of which is such that it can be made very heavy and powerful, so that it will bring about results with little stress. This greatly prolongs the life of the spring, and preserves its resiliency intact no matter how frequently it may be used. This spring, at its inner end, is connected by a link joint to one of a pair of toothed segments, F and F1. At its outer end it is connected by a lever, G, to a bar, H. The lever G can be moved back and forth along the bar H and held in any desired position by a clamp-screw, I. When the lever G is at the centre of the bar H, the spring is entirely relaxed. By moving it in toward the centre of the shutter, the spring E is slightly bowed, and in its tendency to straighten itself it brings pressure on the segment F, tending to draw it up, which it would do if its action were not held in check by proper devices. Joined to the ends of segments F and F1 are two levers, J and J1, which, in turn, are jointed to bars J2 and J3, these latter being securely attached to the blades B and B1 at K and K1. At L and L1 are catches which engage with bars J and J1 and suspend the action of the shutter until they are released. It will thus be seen that, by the drawing down of the segments F and F1, the bars J2 and J3 will be moved in opposite directions, carrying the blades B and B1 with them. The latches L and L1 are controlled by a cylinder and piston operated by a bulb. Hence, to make an exposure, the lever G is drawn along the bar H a sufficient distance to give the desired pressure on the spring (the greater the distance it is moved, the more the spring is bent and the more rapid the exposure), the latches catching the outer ends of the levers and suspending the action of the spring until released by the bulb action, when the spring relaxes and the exposure is made. To make a second exposure, by moving the lever G along the bar H to a point opposite that at which it was first set, the blades will operate with a movement the reverse of the first movement, or the blades can be instantly restored to their first position by a simple movement, without disturbing the lever G. For retarding the movement of the blades B and B1, a cylinder, M, is provided which acts as a brake on the levers J and J1. This cylinder is pierced with holes, a greater or fewer number of which can be brought into play, the action of the shutter being retarded according to the number of holes left open for the escape of air. When a plate is to be exposed for a considerable length of time, the bulb is transferred from the cylinder L2, which is thrown entirely out of action, to the cylinder M, and a catch, N, is lowered which permits the blades B and B1 to pass but half-way,

leaving the lens open. By relaxing the spring E, the blades can be moved by the action of the air in cylinder M and held open until released. This motion can be easily controlled, and can be made almost instantaneous or greatly prolonged. Another way to make time exposures is to loosen the clamp nut I and move the lever G back and forth by hand.

The equipment of the shutter includes a ready means for changing the diaphragm opening and for making the opening mathematically accurate. For this purpose, three flat metal disks, O, O1, and O2, Fig.2, are provided, around the edges of which are drilled holes of the desired sizes, each opening being numbered consecutively, and the openings for the stereoscopic lenses being drilled in proportion to the others so as to produce equivalent openings. These disks are all moved in harmony by a knob, P, so that opposite each of the lenses shall be equivalent openings. The number of the diaphragm opening in use at any time is shown in the opening Q, Fig. 1. This arrangement possesses practical advantages, as it provides for absolute accuracy in the diaphragm, and, where it is desired to take single and stereoscopic pictures of the same object, insures proportionate openings in all lenses.

The entire shutter is made of aluminum and is very compact, its entire thickness being about three-sixteenths of an inch. The lens sockets are made with interrupted threads, as shown in Figs. 3 and 3*a*. By using threads cut out in this manner, the lens is held about as securely as with full thread, and can be put in position and locked with a single movement. This is a very handy method where a variety of lenses is carried and changed to suit special conditions.

As previously stated, the distinguishing feature of this shutter is that it provides, in compact and convenient form, a means for taking both single and stereoscopic pictures. The ordinary equipment for stereoscopic work is an unhandy addition to the outfit, and its use involves considerable trouble in changing the camera whenever a stereoscopic picture is to be taken. With this shutter, the addition to the weight of the camera amounts to nothing practically, and both stereoscopic and single lenses are always ready for instant use. There are many bits of scenery peculiarly adapted to stereoscopic treatment, and, in cases where it is desired to take both single and stereoscopic pictures of the same subject, the particular advantages of this shutter are very apparent. The diaphragms and lenses all being set in harmony and regulated by a single action, both types of pictures can be made at one setting of the camera. Aside from this special advantage, this shutter for all-around work has few equals. The facilities for both instantaneous and time exposures are complete, and give the operator entire control of the duration of the exposure. It is, in short, a shutter of great general utility, suitable for field work under the most varied conditions, and well calculated to meet the various and often unexpected contingencies which so commonly confront the photographer.

Engraved by
Electric City Eng. Co.,
Buffalo, N. Y.

By Knaffl Bros.

FROM COMPLIMENTARY EXHIBIT,
P. A. OF A. CONVENTION, 1899

By selecting suitable lenses in combination with a shutter of this type, the amateur can supply himself with facilities for a wide range of work without encumbering himself unduly. For example: a line of lenses could be selected from Series 2 of the Dallmeyer Stigmatics, which would include a well-balanced series of focuses. Suppose two lenses No. 1A of this series were used for stereoscopic work. With the full lens the equivalent focus is 4 inches, with the front combination 6 inches, and with the back combination 8 inches. For 5x8 single plates, No. 5 of this series will give 9 inches, 13.5 inches, and 18 inches. These lenses can all be fixed in the shutter and carried as conveniently as a single lens. With an extra emergency wide-angle lens, say No. 2, working at 5.3 inches, 7.9 inches and 10.6 inches, the assortment is complete, and the photographer is prepared for pretty much anything that may come his way.

To derive full benefit from such a shutter and lens equipment the camera should be of the square front type, with long bellows (say eighteen inches), with sliding detachable front and swing back. Such an outfit is an ideal one for the amateur, and it is matter of surprise that lens and camera makers have never placed anything of the sort on the market. It could not fail of popularity, as the want of some such handy all-around outfit has been felt by many amateurs, who would be tempted to try their hands at stereoscopic work if they were not deterred by the inconvenience of carrying around the cumbersome equipment commonly used.

PRESENT METHOD OF TONING

By Robert E. M. Bain

IT seems a pity that the fad for an easy method of toning should have led us to accept the cold black tones that now seem to be predominant, for the warm tones, that required some experience to produce with the best effect. What seems to be wanted now is a bath in which you may place the prints till they get "gray," when they are fixed, or, more lately still, a bath that simply requires one to place prints in it for ten minutes, when they are found to be fixed and toned as well. The results are cold, hard, lack depth and feeling, and, while they may have the "engraving effect," it can hardly be said that they look like good steel-engravings, for a really good engraving would shame any of them.

Platinum prints make fine pictures when the subject is selected with care; but all negatives will not make good platinum prints, nor will good negatives of all subjects, while a majority of negatives *will* make good prints, if they are intrinsically good negatives, if they are printed in warm, rich tones from a deep brown to a rich purple.

A few years ago a print made from some of the papers now hav-

ing large sale would not have been "accepted" at an exhibition; but "everything goes" now, and the careful worker is handicapped by those who buy all mixtures ready prepared, and get credit for work that is more the manufacturers' than their own. All of this is to be regretted, for it has a tendency to discourage those who work for the best effects rather than for the easiest method. Let those who do good work look to it that they get the best effects from their negatives, and print those in sepia that are best adapted for that kind of print, and those in platinum that give by that method the most artistic result. Let those who would obtain the most satisfactory pictures use some judgment in their work, and not adopt a method that gives the least work, for it generally gives the least satisfaction as well.

MULTIPLE EXPOSURES

By Robert M. Reevs

(Illustrations by the Author)

SOMETIMES it is advantageous to make two or more exposures on one plate. To present one method of doing this is the object of this writing. Those who own a ferrotype or Victoria camera would perhaps prefer it for the purpose, but it is unnecessary to add one to our stock of photographic possessions, as a similar result can be accomplished with a 4x5 folding hand or other suitable camera with a little carefulness, a good quality to have on hand at all times The usual form of ferrotype camera has either four, six, or nine lenses, the images being produced in multiples of these numbers by means of suitable openings in cardboard screens and a shifting device at the back of the camera. The following method differs somewhat from the above-named in that but one image is produced at a time, each exposure being for a different pose With care in remembering what part of the plate you are working on, the experimenter has a good chance to secure studies of posing and lighting, all on the same plate, handy for comparison, and without any extra expense for a separate camera.

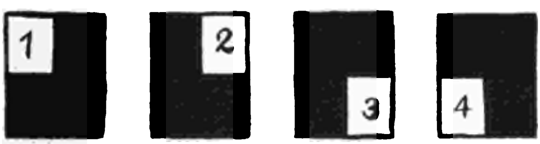
As it is of importance to produce images that will print alike or nearly so, care should be exercised to make the proper exposure for each subject, and as the process requires a little time to complete a series, the difference in daylight, the sun being obscured or clear-shining, should be allowed for. A slight difference in the density of one of the images may be compensated for by masking suitably, either for thinness or density.

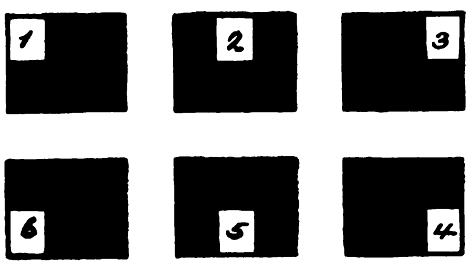
Most hand cameras being set for a five-foot near focus, their copying facilities are somewhat limited. Using the screens, this may be partially compensated for by being enabled to get four or six images on the plate, the reduction in size of image doing no harm, because little of the plate is wasted.

The Old Senate House

The borders of the resulting pictures may be black or white. The former is obtained by cutting with a knife-edge and ruler two straight cuts, and scraping away the film between them, thus forming clear glass borders in the negative; the latter, by cutting strips of black paper of suitable width, placing them at proper intervals apart, and fastening their ends to the back, or glass side of the negative with a little paste.

The routine of operations is as follows: For each picture, first remove the ground glass, and place screen in proper position; second, return ground glass to its place, and focus and centre object; third, make exposure with plate holder in, and when finished proceed likewise for each successive picture. This method of producing multiple pictures is applicable to roll films, only where the camera is fitted with a detachable roll holder. In making the exposures, make either the upper or lower set first, then change the height of camera for the next set.





Diagrams appended herewith show the positions of screens and suc-

cession of exposures for four and six exposure plates, the respective openings being one-fourth and one-sixth the size of the cardboard. But one screen is needed for four exposures, and two for six exposures, while for three exposures three pieces of cardboard are necessary. Diamond or other shaped openings in screens may be made to suit the ingenuity of the experimenter; but in such cases opaque screens must be provided to prevent double exposures, especially if openings are irregularly placed. All screens should be blackened well on both sides after cutting away openings, common black ink answering the purpose; and also made a trifle larger than the inside of the frame in one direction only, as they should remain in place while the ground glass and holder are being removed and replaced. Other applications of this method will, no doubt, suggest themselves as occasion arises.

The Coming Storm

THE RETOUCHING-KNIFE

By Henry Erle Cooper

IN drawing the attention of the readers of the ANNUAL to the use of the retouching-knife, I am fully aware that I am not the herald of any new discovery. My wish, however, is to emphasize the value of a power which up to the present time has been but scantily appreciated. It is somewhat strange that the use of the knife in conjuncture with the pencil, at the retouching desk, is so slowly finding favor with retouchers. By its aid a new power is placed in the hands of the photographer. Whereas in the past he possessed only the power to modify the negative by adding density or lights to the negative, with the aid of the knife he is enabled to increase the shadows and reduce the high lights or any portion of the negative he may desire. Again, with the knife it is possible to remove any por-

tion that may not be desired which at the time of exposing escaped the eye or was incapable of removal.

Probably the knife will be found most useful in cases of movement and double images. Every photographer must at various times have had occasion to regret the spoiling of some important negative through a movement of the sitter. With a group this is a more frequent occurrence, especially when pet animals, dogs, for instance, are included. With children, too, an otherwise good negative is often spoiled by double hands, arms, or feet. With the pencil alone, it is seldom possible to remove all traces of the movement, but with the knife the removal of any secondary image is easily accomplished. Again, should the head-rest or any other objectionable feature show, it ought not to be a difficult matter to effectually remove all traces of the defect. In cases where the hair shows signs of grayness or lightness, a careful darkening will be appreciated by the sitter. The great advantage of doing this with the knife on the negative is that, unlike brushwork on the print, there is no sign of it, and, moreover, a thousand prints may be printed without any necessity of again touching the defect.

Like retouching with the pencil, it is an art that requires a steady hand, good eyesight, and incessant practice. To those retouchers who have not yet attempted to use the knife, the following hints may be of some service. In the first place, it is important that the film be quite dry and hard; also, that it be unvarnished and free from medium. In working at the desk, it is essential to use a strong light to see by. The light that is sufficient to retouch by will be too weak to work by with the knife. I believe that special knives for retouching are sold, but personally I have found the sharp blade of a good penknife with a firm handle quite sufficient. Probably the most important point in using the knife is, never to allow it to go right through the film. Doubtless, at first, this will be found difficult to avoid, but with practice it will be found possible to cut half way through the film, or, rather, to scrape it thin. To do this properly it is necessary to hold the blade of the knife at right angles to the surface of the negative, and reduce the thickness of the film by gradually scraping it away. Of course, this is a somewhat delicate operation, and had better not be attempted on an important negative until thorough proficiency has been acquired.

As I said before, nothing but incessant practice on unimportant negatives will produce success. To those, however, who do succeed in attaining the necessary skill, the trouble involved will be well repaid by the additional power acquired.

IMPERSONATIONS

By E. E. Weatherby

(Illustrations by the Author)

IT has been my good fortune during the past year to make quite a lot of character work for a well-known impersonator. That the results were satisfactory to him is attested by his earnest words of appreciation upon receipt of the work. I believe, however, that to a very considerable extent the success of the finished work was due to the subject himself. But why?

Have we not seen character work in which the disguise was not only "thin," but ridiculous as well? Have we not seen many a brave warrior (?) in the act of drawing a sword, the expression accompanying the act being such as might be caused by acute indigestion, or the blank look of the imbecile, instead of the determined look necessary to give the face the proper appearance and to harmonize with the balance of the picture? One is dismayed in trying to determine whether it is a case of attempted suicide, frustrated by a too tightly sheathed sword, or, perchance, the figure of a poor unfortunate whose reason has been dethroned and who now imagines himself to be Alexander the Great.

What is wrong? Why these incongruous productions? Is it the fault of the operator?

Only partially so! For a successful portrayal of this class of work, the disguise of the original must be deeper than the paint with which it is outwardly obtained.

I have in mind the person referred to above. To work with and for him is a pleasure. He not only appreciates what you are doing and aids you at every turn, but he so completely loses all consciousness of his natural self that for the time being he is actually the character he is impersonating. From the time he appears under the skylight until he divests himself of his "make-up," he claims that he cannot be other than the character he represents. All his inquiries and suggestions, for instance, are made in a tone of voice exactly

Impersonations

suiting the impersonation, and I find myself frequently on the point of forgetting the real person, so completely is his identity hidden under the disguise.

With such a subject one is assured of success if he does his duty. Coupled with his versatility is his willingness to comply with any suggestion made with reference to aiding him along certain lines; and, as his confidence in the operator is unbounded, he does not try to lord it over the one who is endeavoring to reproduce and retain his efforts for future inspection.

The subject should pose himself to a certain extent, as he naturally has a better conception of the rôle he is assuming than one who may, perchance, have no idea of the part whatever. In that case, it would obviously be folly for the operator to dictate simply to obtain certain effects, which, though they might be pleasing to him, might be entirely foreign to the ideal he is working out.

It is not easy to assume a character, or, in other words, to be other than our natural selves, and hence it is that we have so many poor impersonators scattered abroad. No matter how fine your chemical results may be, no matter what accessories are introduced into the picture to carry out your ideas, or what trouble you put yourself to in any way, if you find no response in your subject to the ideal you and he have in view, your results are sure to be failures.

Get your subject to enter fully into this ideal, neglect none of the little details which so materially aid in making your work a success, and, as the old saying goes, "All things else being equal," your efforts must of necessity bear evidence of honesty, to say the least.

ARCHITECTURAL WORK

By Fred W. Pilditch

WE fear that the popularizing of the hand camera, which means in not a few instances the depopularizing of photography, has had an injurious effect upon the fascinating charm of architectural work, particularly in the case of our younger disciples. We do not wish to be misunderstood. Being the author of a booklet on

the use of the hand camera, and having, under the style of "Verton," contributed to last year's ANNUAL an article in favor of the use of hand and other small cameras, we would be the last to sound anything but eulogiums in favor of such instruments.

But the hand camera is merely an indication of the times in which we live. It suits the headlong hustling of the present day, and its unique simplicity of action, combined with great portability and unobtrusiveness, makes it a valuable adjunct and recreation to many in their struggle for existence.


The Angel Choir, Lincoln Minster *By James Gale*

We are convinced, then, that architectural work—especially is this the case with interiors—is a "wee bit slow" in many instances, and thus we get only a minimum of our recent workers taking up this beautiful, restful, reposeful line of work.

Now, it is to those who have had this opinion that we address the couple or so of hints which are to follow, and by which we hope the weariness of waiting will be reduced to the vanishing point. During this interval of exposure, which is often one of prolonged duration, we invariably, when alone, sit and read the history, romance, or tradition of the building which is forming the subject of our photography; and warning is here given, viz., Do not forget the photography by becoming too absorbed in the reading process. It is surprising how soon an hour slips by while we are so engaged.

Failing this, or perhaps of more importance, we may occupy our time in photographing by means of a hand camera, or other smaller

instrument, detailed work in design, or characteristic carving, or the symbolic system of devices dear to all archaeologists. But as these forms require " time exposures," it will be necessary to be able to support the instrument, and we find that a yard or two of string is often useful for attaching the camera to knob, gate, or pillar, or even to a drawing-pin well pressed into either wood or plaster. Some three or four views may be secured in this way while the first exposure is being made in the larger instrument. But the warning now is this: Do not get " too many irons in the fire."

If your inclination urges you in neither of the above suggestions, then we advise a tour of inspection with the idea of selecting positions for your future exposures, and then you will have no need to rush and select when the first view has been taken. In looking around you will be astonished to find what a wealth of subject will be found, especially in our older churches, by way of monuments, monumental brasses, stone tablets, and other stone effigies. The time occupied in doing this is spent to advantage, and we have often remained the whole day in a church alone, without feeling wearied or tired, and have emerged with additional knowledge upon the building which we selected, thereby adding considerable feeling and interest to the photographs we have taken. Such days as these we personally enjoy, except from the point that in churches and the like the memorial stones enforce upon us the truth that

" We are such stuff as dreams are made of,
And our little life is rounded in a sleep."

PRECONCEPTION

By G. W. Pach.

THE importance of having vividly in mind your subject, be it a portrait, view, group, or what-not, before you draw the slide is not sufficiently understood, but it should be a matter of deep concern and interest. Just try it in your practice, and take, for instance, the scene upon which you are about to draw the slide, and imagine it as you would have it finished, and even framed. Trim the picture mentally, either narrow or broad as it may suit your feeling and fancy, and get the strength of light and shade. All these things must be governed by the conditions that confront you. Now is the time not to go on, if the position does not suit you, or to take the consequences if you make the exposure; for, be it good, bad, or indifferent, you are the author. My point is that you be sure to see the work finished in your mind's eye before you drive a nail. Now, to give a clearer example of what I mean, take, for instance, the world's wonder, the Brooklyn Bridge. Roebling had in his mental vision this whole structure suspended across the


Twilight *By Wm. Ferris, Jr.*

river before a single wire was told out. There the skill of the inventor played its part. If he detected a flaw, then was the time to set it right, not after the Bridge was built with its expenditure of millions. I hope this thought may impress some readers of the ANNUAL at least, and help them to procure results on the basis of mental calculations. When your work is finished, study it, and compare it with your mental notes. The same advice holds good in the case of a portrait. Does not the expression suit you? Study it, and lead your subject into a frame of mind or line of thought that will suggest the expression you desire. Much skill can be displayed in bringing this about, and the victim need not look as if he were about to be executed. If anything in these few lines proves of help to the beginner or struggler, I shall be well repaid.

A LANTERN SLIDE PROCESS OF TWENTY YEARS AGO

BY H. PICKERING.

I OFTEN wonder if the dry plate lantern slide workers ever saw a dry *wet* lantern plate manipulated. The term "dry wet" may seem a bit ambiguous, but it will explain itself later on. When I used the collodion process (and I often use it now), the dry collodion was a very favorite process, and to-day the results are not to be beaten. Perhaps in the later makes of gelatine lantern plates a trifle more detail is to be observed, and, it is true, a greater range of color is obtainable; but how often are various colors required? I do not see any color to approach the lustrous velvety purple of the dry collodion slide, something like the bloom one sees on the

Engraved by
Art Engraving Co.,
St. Paul, Minn.

OCTOBER

By Walter Sprange

grape when it is hanging on the vine, and it has a further similitude in this respect, it will brush off if rubbed before dry. Then there is another aspect of the case, a condition which appeals to amateurs who find serious inroads on their pockets with lantern plates at one shilling a dozen. I refer to the economy of the process, because, if the plate after development proves a failure, it can be used over and over again by flowing and sensitizing. The difference in cost is remarkable. A dozen of the dry collodion plates can be made for 3*d* or 4*d* (not exceeding 10 cents), and the developer costs but little or nothing.

Any collodion will give good results, but I prefer a bromo-iodized sample rather red in color. If it is too new to give the acid reaction and red color, add the smallest quantity of iodine, or a few drops of tincture of iodine, and filter through cotton wool. Then flow the plate in the ordinary way, and allow the film to set just a little longer than you would if you were going to use it for a wet plate. Then place in a dipping-bath, thirty-five grains to the ounce of silver, and slightly acid, certainly not alkaline, for four or five minutes, take out, and drain. Wash well under the tap. Mind, it must be washed well, because on this depends its future keeping quality. Now pour on the plate about a teaspoonful of the following preservative mixture, and allow it to flow over the plate and off at one corner into the sink; again with another teaspoonful, and flow off at another corner, and so on for the four corners. The preservative is compounded thus: Take half a pint of good ale, and dissolve in it half an ounce of lump sugar, and filter; but before filtering, shake it up well, and leave the cork out to disengage the gas, or it will eventually cause pinholes in the film where a bubble of gas has prevented the preservative from flowing. This will keep any length of time, and the older the better. Place the plate on edge on blotting-paper in the dark in a warm place to dry, and mind to dry equably, or a line will result. The plates can now be put away until required, and will keep well for at least a month, if properly washed before flowing with preservative. If they are not well washed, they will gradually develop a brown color on the film, and the whites of the image will suffer.

For exposure, of course, a great deal depends on light and class of negative; but I find for contact exposure two seconds to daylight ample. When the plate has been exposed, take it into the dark-room, wash off the preservative by flowing for a few minutes with water, and then, holdng the plate by one corner with the finger and thumb of the left hand (the characteristic collodion develop), pour on a tablespoonful of the following developer:

Pyro	2 grains.
Citric acid	28 "
Silver bath	2 drops.
Water	1 ounce.

Keep pouring on the plate and tilting it off into the measure

and back again slowly, and the picture develops up slowly, beautifully, and pluckily. If not plucky enough, add another drop of bath solution, but do not have the blacks too black. Leave them slightly gray, transparent, showing the detail in the shadows. When the development has proceeded far enough, wash well with water, and fix, either with 25 per cent. hypo solution or a 5 per cent. cyanide of potassium solution. I like the latter clearing the best for collodion plates. Again wash well and dry, and, if the resulting color is not to your mind, tone it in one of the many ways now offered for toning lantern slides; or the color may be changed to a purple bordering on a violet by flowing with the following solution and well washing:

Iodide of potassium, one dram, dissolved in four ounces of water; add until the precipitate is redissolved a solution containing 10 per cent. bichloride of mercury. This forms a powerful intensifying agent, and according to dilution with water will give a great range of density.

I am quite sure that this process will commend itself to any one who will conduct the process properly in its early stages.

F. W. J.

PRODUCTION OF NEGATIVE VARNISHES BY MEANS OF EPICHLORHYDRIN

By Prof. E. Valenta

(*Translated by Henry Dietrich*)

THE *epichlorhydrin* is a colorless liquid of agreeable odor, which is produced from dichlorhydrin ($C_3H_6Cl_2OH$) by treatment with solid caustic soda. Its composition corresponds to the formula C_3H_6ClO. It boils at 117° C., and is a good solvent for nitrocellulose. *H. Flemming* recommends it for the production of nitrocellulose varnishes (Japan varnish), as also for the gumming of celluloid.

I tested the behavior of this body in comparison with a number of

gums which serve for the production of varnish, and found that it is a very good solvent for certain copals, and in combination with the latter gives varnishes which leave a very hard surface, with great power of resistance. These varnishes (correspondingly diluted) are very suitable for the varnishing of bromide of silver gelatine negatives. The coating is very solid, and allows plenty of retouching with the lead pencil.

I give herewith a formula for the production of such a negative varnish, and would say that it can be applied to advantage either warm or cold:

Digest 20 grams of Manila copal with 70 grams of epichlorhydrin in a beaker-glass for some time in a water-bath, and after solution add 100 c. c. of alcohol.

The varnish is filtered, and according to requirement is diluted with a mixture of equal parts of epichlorhydrin and alcohol.

WHY PRINTS TURN YELLOW

By John R. Clemons

PHOTOGRAPHS will not fade if they are properly prepared for keeping. There is hardly an establishment to be found where you may not see faded and yellow prints hanging on the walls or in the show-cases. Proprietors who are busily engaged are not able to attend to details and be in all and every department, and the printing-room is where the work suffers most, as it is often given to incompetent hands at low wages, who never read photographic works. I know I am treading on the toes of some of my best friends, but I have said this much, and here I stop and proceed with my tale of woe.

When prints are only half washed, then toned, and placed in the hypo bath, their fate is sealed. It is here the prints meet their destruction by the formation of hyposulphite of silver in the print. The print at first has the appearance of being in perfect bloom, but it will not be long before you can see it is changing in tone and taking on a yellow cast. I paid $1.50 apiece for some prints before the Centennial opened in 1876, which now are yellow and have a faded look. I also have prints made from ten to twelve years ago that do not appear to have changed in the least.

T. Frederick Harwich, in his "Photographic Chemistry," 1856, page 98, gives the following directions for the production of hyposulphite of silver:

"Twenty-one grains of nitrate of silver and sixteen grains of hyposulphite of soda may be taken, dissolving each, in separate vessels, in half an ounce of distilled water. These solutions are to be added to each other and well agitated. Immediately a dense

deposit forms, which is hyposulphite of silver. At this point a curious series of changes commences. The precipitate, at first white and curdy, soon alters in color. It becomes canary yellow, then of a rich orange yellow, afterward liver color, and finally black. The rationale of these changes is explained to a certain extent by studying the composition of the hyposulphite of silver."

There should be at all times an excess of hyposulphite of soda, to make sure that there are no unfixed blotches to be seen from bubbles, showing dark spots after the print is washed and dried. The prints should be kept moving until they are ready to be removed from the hypo bath. The aluminum chloride and gold bath is to be commended, as the aluminum forms a pabulum for the deposit of gold.

By B. L. H. Dabbs

I have shown that hyposulphite of soda will not act upon nitrate of silver further than to turn it into an insoluble dark compound; but it has other qualities, and it is a poor rule that will not work both ways. The following will show that hyposulphite of soda acts readily upon chloride of silver: Dissolve twenty-one grains of nitrate of silver in a small quantity of water, then throw down the dissolved silver with table salt. When this is accomplished, wash the precipitate well to free it from the salt. Then dissolve sixteen grains of hyposulphite of soda in a like portion of water, and add to the dissolved silver nitrate, when it will take up the chloride that was already formed.

I send with this my formula for silvering and toning with gold and aluminum, and salting the prints from the toning bath. Here is where a perfect chloride is formed with the silver that has been left in the print from the washing. (It is to be seen that hyposulphite will not remove free nitrate of silver from the print, but readily when turned into a chloride of silver.)

Silver Solution for Matt Surface Paper.—(Ammonia—Nitrate of Silver.)

Silver .... 480 grains Troy.
Water .... 11 ounces.

Dissolve and pour off two ounces, and to the nine ounces left add strong aqua ammonia to form a precipitate and redissolve the pre-

PORTRAIT STUDIES

By E. C. Dinturff

cipitate, then add the remaining two ounces, which will form another precipitate; to this add nine drops of nitric acid, C. P. Apply this to the paper with a tuft of cotton. See that the sheet is well covered when dry. Print without fuming.

Any good toning bath will give good results, but I use an aluminum toning bath, which is prepared as follows:

Aluminum Toning Bath—(Formula, Stock Solution.)

Chloride aluminum	80 grains.
Bicarbonate of soda	360 "
Water	48 ounces.

When mixed this will form a flocky hydrate which will settle to the bottom. It can be strained through clean washed muslin. To prepare a small bath for toning, take tweleve ounces of the stock solution, and add sufficient gold to tone in eight to ten minutes, The gold solution must be neutralized with bicarbonate of soda before adding to the above bath. When the prints reach the desired tone, throw them into a bath of salt water, made of water, one gallon, table salt, one ounce. This will arrest further toning, and at the same time turn the free nitrate of silver that is left after the first washing into a chloride, and the hypo bath will clear or fix them very much quicker. By using the aluminum bath, the prints change very little in tone in the fixing solution. If you have albumen prints, tone them first. Generally there is enough gold left to tone a large amount of plain paper prints.

The Fixing Bath.

Hypo	2 ounces.
Water	12 "

Prints will fix in about five minutes, with but slight change in tone.

TRANSPARENCIES

By H. W. Hales

THERE is probably nothing more beautiful in the whole photographic world than a good transparency or lantern slide, and, judging from the few really fine specimens seen, this branch of the art is not nearly so much practiced as it deserves to be. What can be more beautiful to a lover of art than the exquisite detail, delicate half-tones, and the brilliant snap or sparkle in a well-made transparency. The photographic worker who is also an artist (and there are now many such), who has not viewed first-class transparencies through the stereoscope, has certainly a new pleasure in store, and,

when these binocular pictures are of familiar scenes, they possess an additional interest to him. One reason why so many photographers do so little transparency work is the supposed difficulty in making them with any certainty of good quality, but this can soon be overcome with a little practice. I would not by any means advocate trying to make them from the average snap-shot negative; but, given a good time exposure to bring out all the detail, and carefully developed to avoid fog, the probabilities are that you will soon succeed. It is only the perfect negative that will usually give the perfect transparency or slide, and on this account every available means should be taken to have the negative as perfect as possible.

It is not the intention of the writer to give full directions for making transparencies, as such are easily found in the many good books and magazines, but simply to give a few practical hints that are perhaps sometimes overlooked.

In making the negative, be sure that the plate is not fogged while placing in holder in dark-room. Give an ample exposure, and develop to get out all detail possible, especially the half-tones and shadows. Develop very slowly, and keep the developing dish or tray covered as much as possible while so doing, as this prevents fog and adds much to the brilliancy of the results.

Transparencies can either be made by contact or by reduction, and, when properly done, the writer can see but little difference in the results. While lantern slides are usually made by reduction, the larger sizes can be made very fine by contact with much less work. For the transparencies themselves a very slow plate is necessary, and, while the writer has no desire to advocate any particular brand, he has always found the Carbutt B to give excellent results. A metol developer is particularly adapted to this work, and it is important to carry the development far enough, as usually the image weakens somewhat in the fixing bath. Transparencies made for the window should be made more dense than those intended for lantern slides, and, if ground glass is used for the former, it should be of fine quality, as many fine transparencies are ruined by being mounted with coarse-grained glass. A very neat and inexpensive way to mount them for the window is to use ordinary lantern slide binding. Then take four small brass rings, about half an inch in diameter, and bend them to oval shape. Place these over the four corners of the transparency, and connect them together by pieces of light brass chain. See that the links are properly closed (using a very small pair of round steel pliers for the purpose), and strain the chain up tightly, so that the glasses cannot possibly slip out at the corners and so get broken. A piece of chain of any length necessary is then fastened to the two top corner rings to hang the picture by, and the transparency is complete.

Sentimental Tommy *By A. Cochrane*

DEVELOPERS

By E. O. Cockayne

DEVELOPERS are divided into two classes, Acid and Alkaline. The former is now rarely used except for black and white work, as silver is more easily reduced in an alkaline than in an acid solution. Ferrous oxalate is of the acid class. All the others, such as pyro, metol, hydrochinone, eikonogen, amidol, glycin, rodinal, ortol, thiocarbamidol, metacarbol, diphenal, diogen, trenol, etc., require the addition of an alkali, or are already associated with one.

An Alkaline Developer, therefore, consists of the Developing Agent proper, such as pyro, hydrochinone, etc., which reduces the silver salt that has been exposed to the action of light to its metallic form; an Alkali, such as ammonia solution, caustic soda, caustic potash, anhydrous carbonate of soda, anhydrous carbonate of potash, crystal carbonate of potash, crystalline carbonate of soda, or the sesquicarbonate of ammonia, although the last is but rarely used; and a Preservative, such as sulphite of soda or metabisulphite of potash, which has an affinity for oxygen, and thus prevents the developer from oxidation and discoloration.

The Alkalies not only have a chemical action, but also a physical one, softening the gelatine films, and allowing the solution to act on all parts. If used in excess, too dense negatives will be produced, there will be liability to cause fog and granulation; whereas, if too little is used, development will be retarded, and harsh negatives, with too great contrast, will be the result.

The alkalies are accelerators, the two most generally used in this country being carbonate of soda or carbonate of potash, either in crystals or granular, i.e., dried. The former, carbonate of soda, has some tendency to stain the gelatine yellow, a fault from which carbonate of potash is free; but, on the other hand, potash has a more destructive action on the gelatine, and consequent tendency to cause "frill."

Sodium Carbonate.—One part soluble in two parts cold, or one part hot, water. About same value in developer as sesquicarbonate of ammonia. Five parts granular is equal to twelve parts crystals; 7.150 parts of sodium carbonate crystals being equal to 4.350 parts of potassium carbonate crystals.

Potassium Carbonate, Crystals.—One part soluble in three fourths part cold, or one-half part hot, water. Five parts dried is equal to six parts crystals.

Developing Value of the Alkalies.

(*From W. B. Bolton's Table, British Journal Photo. Almanac, 1899.*)

Sesquicarbonate of ammonia.	7.250 parts	=	1.000 part	Caustic	Soda.		
Carbonate of soda, crystals..	7.150	"	=	"	"	"	"
Carbonate of potash, crystals.	4.350	"	=	"	"	"	"
Carbonate of potash, dried..	3.450	"	=	"	"	"	"
Carbonate of soda, dried....	2.650	"	=	"	"	"	"
Caustic potash	1.400	"	=	"	"	"	"
Caustic soda	1.000	"	=	"	"	"	"
Ammonia, 88° sol..........	.750?	"	=	"	"	"	"

Sodium Sulphite.—One part soluble in four parts cold, or two parts hot, water. Insoluble in alcohol. Granular is double the strength of crystalline.

Sulphite of Sodium is added to developer to preserve it from oxidation. In small quantities it produces warm tones; in large quantities, gray or bluish black tones.

If old and oxidized (when it becomes reduced to a sulphate), it acts as a powerful restrainer, causes yellow stains on the gelatine, and especially in connection with amidol, appears to destroy the latent image. (H. Hood, *Br. Jour. Photo. Al.*, 1889, p. 767.) An addition of 2½ per cent. methylated alcohol retards oxidation of solution of this salt.

With the number of developing agents now on the market, to which new ones are constantly being added, it is a matter of considerable difficulty to the average amateur or professional photographer to decide which one is best suited to his particular requirements. The chemistry of their composition is generally a matter of supreme indifference to him. He may have seen splendid results produced with any or all of them; but how is he to decide which one is best adapted to his own particular needs? The professional operator can rarely afford to experiment with new material and risk possible failure by so doing, and is therefore likely to be almost the last to take advantage of any new discoveries or improvements until after they have been thoroughly tried and proved by the ambitious amateur, to whom failure means experience only—time lost with him being of no particular consequence, and as he is out for pleasure only, a dollar more or less is of comparatively small moment. But the professional can take no chances with his sitters, many of whom would almost as soon visit the dentist as sit for their portraits; consequently the professional generally sticks to the pyro developer, knowing by years of experience just what can be expected from it. The amateur, however, takes an instinctive dislike to pyro. It is dirty and stains his fingers, besides which it will not keep well in solution, or perhaps is too slow to suit him. The literature on the subject of

pyro developers, and how to use them, is so voluminous that it only confuses him, and he has neither time nor inclination to try all the different methods suggested, to overcome the disadvantages of which he complains. Ferrous oxalate presents even greater disadvantages, and, as it is now rarely used, we will confine ourselves to the better known of the more recent developers, such as hydrochinone, eikonogen, amidol, rodinal, metol, glycin, and ortol; leaving the others, such as metacarbol, thiocarbamidol, trenol, diphenal, diogen, and pyrocatechin, to be considered at some future time, as at present it is doubtful what position these latter are entitled to on the score of practical use. Neither does it seem advisable to discuss combination developers, such as eiko-hydro, metol-quinone, etc., which at best are attempts, more or less successful, to overcome the faults inherent in one or other of the ingredients.

In order that we may have a practical basis for comparison, we must first determine what may constitute *an ideal developer,* not only as to what it should do, but also what it should not do, and, this being agreed upon, it will be a simple matter to determine which of those under discussion comes nearest to meeting these requirements, or may be best suited to any special line of work.

The Ideal Developer

should admit of extreme latitude in exposure, therefore should be easy to control, and should work neither too quickly nor too slowly, and either black and white, or soft, negatives should be obtainable by its use.

It should not cause chemical fog, no matter how long the development.

It should keep clear in solution both before and after use, and be capable of repeated use.

It should be readily soluble, and should not lose energy at low temperatures.

It should not stain negative or fingers.

It should not harden the gelatine, and thereby retard fixation; neither should it soften it unduly, and cause frilling.

It should produce negatives of good printing color, and negatives produced with it should not lose strength in fixing.

It should not be expensive in actual work.

It should require little if any caustic alkali, as this attacks both film and fingers.

Hydrochinone.—In chemical composition, it is very similar to pyrogallic acid, its employment in place of the latter being first suggested by Capt. Abney, in 1880. (" Story of Photography," by A. T. Story, 1898, D. Appleton & Co.)

It is somewhat slower than pyro, and yields the best results at a temperature of 65° to 70° F., as it is practically inert at low tempera-

ture, and to secure the best results must never be below 60° F.—(Vogel.)

Hydrochinone is one of the best developing agents known, and with ordinary care can be made to yield exquisite detail and modulation if used sufficiently dilute; or negatives with dense high lights, and clean shadows suitable for half-tone work, can be made equally readily. Greater density is possible than with either amidol or metol, and it has little if any tendency to cause chemical fog.

It will keep well, and works even better old than fresh where very soft negatives are wanted, but, if cold or too concentrated, causes harshness.

Hydrochinone is listed at $3.60 a pound, and, as it can be used and reused, is one of the least expensive developers. It does not stain either hands or film. Plates developed with this agent must be thoroughly washed before fixing, otherwise a deposit of metallic silver will be precipitated on the surface of the negative, which, if not afterward removed by reducing (with red prussiate and hypo, or ammonium persulphate), will become yellow, and spoil its printing quality.

Freshly mixed hydrochinone developer acts too strongly unless bromide is freely used.

The addition of yellow prussiate of potash to the developer accelerates development, makes clearer image, and prevents fog. With this developer, great latitude of exposure is possible, a strong feature in its favor.

When using with caustic potash or soda, on undertimed plates, should the plate exhibit a tendency to frill, place it without washing in a saturated solution of citrate of potash for five to ten minutes, then wash and fix in usual manner.

Unless kept under control, or if used too cold, this developer has a tendency to produce hardness, but this is rather the fault of manipulation, than inherent in the hydrochinone itself.

The following formula is thoroughly reliable:

No. 1.—Sulphite of soda	30 grams.
Hydrochinone	5 "
Water	250 c. c.
No. 2.—Soda carbonate	60 grams.
Water	250 c. c.

For use, mix equal parts of Nos. 1 and 2, adding bromide if required.

Amidol.—Andresen, or Hauff. $10.00 a pound. Requires no special alkali. Is excellent for snap-shots or short exposures, and unequaled as a developer for bromide paper or lantern slides. It is extremely rapid, gives good density and excellent detail, and has little if any tendency to produce chemical fog. As the developer can be kept but a short time after using, it is probably the most expensive of all the modern developers. It stains the hands even more than

Engraved by
Blomgren Bros. & Co.
Chicago

THE BIRCH ROAD

By Robert Wilkinson

pyro, and hardens the surface of the gelatine to such an extent, that without the addition of citric acid to the developer it is hardly possible to obtain more than a surface image, and a consequent loss of gradation. From the same cause, plates developed with amidol take a long time to fix. The following formula has been thoroughly tried, and can be confidently recommended:

Sulphite of soda	1½ ounces, or	50 grams.
Potassium bromide	30 grains, "	2 "
Citric acid (to soften the film)	15 " "	1 "
Water	32 ounces, "	1 litre.

To every ounce of above, add 2½ grains of amidol. If it then works too fast, dilute with water. No alkali being required, danger from frilling is minimized. The above formula is that recommended by Dr. O. Lohse, in the *Photo-Almanac* for 1893.

Eikonogen.—Andresen. Listed at $3.85 a pound. Is an excellent developer for snap-shot work or plates that have received but short exposure. Much less latitude of exposure is allowable than with hydrochinone, and considerable practice in regard to working is necessary to prevent flat negatives. The image appears quickly, but only becomes vigorous after long development, potassium carbonate being preferable to soda as an accelerator. For time exposures it is better to use old developer rather than to rely too much on the restraining action of bromide. It does not stain, and can be used over and over, but apparently its use is now generally confined to mixing with hydrochinone, or some other developer. Vogel recommends the following formula (for time exposures):

No. 1.—	Sulphite of soda	100 grams.
	Concentrated sulphuric acid	8 drops.
	Eikonogen	25 grams.
	Water	1,500 "
No. 2.—	Soda carbonate, crystals	150 grams.
	Water	1,000 "

For use add three parts of No. 1 to one part of No. 2. Add bromide.

Story, in "Story of Photography," (D. Appleton & Co., 1898), recommends citric acid in preference to bromide for preventing fog and correcting over-exposure. (Its action is probably physical. Citrate of potash, 10 per cent. solution, seems preferable to citric acid.—E. O. C.)

Metol (Sulphate of Methylparamidometacresol).—Is one of the most powerful of the recent developers, and admirably suitable for plates that have received a minimum of exposure. It is rapid in action, producing soft negatives with good detail, but is less suitable for time exposures, as it is not so easily controlled as a more deliberate agent, such as pyro. Its advantage over hydrochinone is due to the fact that no caustic alkali is necessary. After use, metol devel-

oper gradually assumes a brownish color, but, as it is naturally weaker, it is then useful for over-exposed plates. As the image loses density in fixing, it is necessary to carry development farther than usual. This is a disadvantage, as it requires some practice to know just how far it is necessary to carry development. It is generally advisable to use potassium bromide freely, and a few drops of a 10 per cent. solution of yellow prussiate of potash, which will, to a great extent, prevent formation of chemical fog, which otherwise this developer seems liable to produce on most plates.

Glycin. (Is the Hydrochloric Salt of Paraoxyphenylamidoacetic acid.)—Is a yellowish white crystalline powder, only soluble in water by the addition of its own weight of potash. It is very slow in action, and like hydrochinone has a tendency to hardness if not kept under control, but acts more like pyro than either metol or amidol. In solution with sulphite it is colorless, and will keep indefinitely in well-stoppered bottles, the addition of soda or potash affecting its keeping qualities but very little. It is unexcelled for orthochromatic photomicroscopic, and stellar photography. It is recommended for use where plates have received a minimum of exposure, one thousandth to one-millionth of a second. It gives, without bromide, beautifully clear grayish black negatives of any desired density, with exceptional freedom from fog or veiling. (Jules Fuerst, "Process Year Book," 1897, and "Story of Photography," by A. T. Story.) Bromide acts as a restrainer.

Concentrated Developer.

Sulphite of soda	25 grams.
Dissolved in:	
Water	40 c. c
To which are added:	
Glycin	10 grams.
Potassium carbonate	50 "

For use dilute 15 or 20 times.

More sulphite will improve keeping quality, but is unnecessary and only retards development.

Development.—(Jules Fuerst.)

A.—Sulphite soda, crystals	125 grams	625 grains.
Potassium carbonate	50 "	250 "
Glycin	50 "	250 "
Hot water	1000 c. c	10 ounces.
B.—Potassium carbonate	125 grams	625 grains.
Water	1000 c. c	10 ounces.
C.—Sulphite soda, crystals		125 grams.
Potassium carbonate		250 "
Glycin		50 "
Hot water		1000 c. c.

C is a concentrated one-solution developer.

For normal exposure, take 1 part A, 2 parts B, and 1 part water, or 1 part C diluted with 3 times its bulk of water, or 1 to 6 for under-exposure. For over-exposure, 3 parts A, 2 parts B, and 3 parts water. This increases the amount of glycin, and decreases that of the alkali, although generally the addition of bromide and dilution of the developer with water are all that is necessary.

For under-exposure, developer should be freely diluted to give time for developer to act on slightest light impressions without "plugging" high lights.

For unknown exposures, take 1 part B, 2 parts A, and 2 parts water, to which add 15 drops bromide solution, 10 per cent. If the details appear in less than thirty seconds, the plate is over-exposed. Any tendency to harshness must be remedied by addition of more potash and further dilution.

Stand Development.

Glycin	2 parts, or	10 grains.
Sulphite soda, crystals	2 " "	10 "
Potassium carbonate	10 " "	50 "
Hot water	100 " "	1 ounce.

When all has been dissolved, add:

Water	900 parts, or	9 ounces.

A normally exposed plate will take about a half-hour to develop, where an under-exposed one will take from one to three hours.

No clearing bath is necessary with Glycin.

The foregoing suggests a method by which practical bases of comparison can be arrived at. The data concerning the various developers have been obtained from the manufacturers' prospectuses, and the publications of such authorities as Prof. Husnik, Dr. Eder, Prof. Vogel, etc., and may therefore be considered thoroughly reliable.

THE CAMERA A COLLECTOR OF DATA

By E. G. Tabor

(Illustrations by the Author)

IN an article in Vol. X of the International Annual I attempted to convince collectors, of the usefulness of cameras in field collecting. Since that time a work written by R. Kearton, F.Z.S., of England, has come to the hands of some of the collectors, and the illustrations it contains show that the camera is a collector of certain data, of which, for exactness, amount, and comprehensiveness, the ordinary written data come far short.

Data of to-day are of two kinds, viz., written and illustrated. The written data are records, and give the date of collection, where collected, name and sex of the specimen, and perhaps brief remarks on capture or identification of same. Illustrated data are photographs, and show the live specimens in nature's haunts, surrounded by their natural environments, and you learn from them either natural attitudes, how or where their homes are constructed, or manner of feeding, any or all of which is of fully as much importance scientifically, and of just as much interest to the casual observer.

In making my illustrated data, I use a reversible back, long focus

No. 1

5 x 7 Premo Camera. The long focus is a necessity, and the reversible back a convenient attachment to your camera for this kind of work. Forty feet of small rubber tubing, with a bulb large enough to work the same, is another necessity not commonly attached to a camera. Of course, this will only be used occasionally, but, if you are a field collector, it will not be a very great while before you will find a chance to use it to advantage. The illustrations reproduced with this article required the use of the first and last of the extras above mentioned.

Illustration No. 1 is of a female Least Bittern in the act of leaving her nest. It was taken from the bow of a rowboat, with diaphragm closed to F 16, and an instantaneous exposure with speed at one twenty-fifth second. It is one of the best photographs of a wild bird I have ever succeeded in making.

No. 2 is of two young of the Loggerhead Shrike, just on the point of leaving the nest, three others having already left it. Of course, young birds are easier to photograph than mature birds, as they will allow you to approach quite closely before taking wing. Unless you are using a telephoto lens, you will have to get to within

No. 2

from three to five feet to get a picture of the smaller birds that will be large enough to give you any idea of their form or appearance.

No. 3 is of a Monarch Butterfly, feeding on the sweets of a clover blossom, and was made as follows: The camera was focused on this bunch of clover, and I waited until the butterfly came and alighted thereon, when an exposure with F 16 and one-fifth second was made.

These are but three of the two hundred and over that I have taken in the last three years; but I trust, dear reader, that they

will convince you that the camera is a collector of data that an ordinary field collector makes no note of, and that would otherwise

No. 3

be lost, which would be lamentable when we consider the time and money spent each year in the collection of specimens and their data.

PICTORIAL VALUES

By W. M. Stine

CLOSELY drawn definitions are apt to savor of pedantry, but a term which may have developed a very precise meaning at one period, when in the progress of time and development it is used for something only vaguely resembling the original, becomes so alien to the description of the thing with which it is associated that its use is always

erroneous. Thus, a photograph can never in reality be a picture. Certainly, photographs, by the sanction of custom, are continually called pictures, and will so continue to be named. We have no quarrel with this use of the word, and shall enter no protest against it. It merely challenges us to draw distinctions.

A photograph is a product accomplished wholly by mechanical means, of which the lens, glass plate, and all the other connected objects are clearly recognized as agents. But the vital agent in the mechanics of the photograph is the light ray. All these instruments and agents are capable of being directed by the photographer, but they are in all respects objective, in that they are apart from himself, and in their operation they can accomplish only a reproduction.

Scene in Sullivan County, N. Y. *By William Bayler*

Our word "picture" is derived primarily from a Latin word meaning a painting. To some people, a painter is a clever, imitative individual, quick to perceive details of form and gradations of light and color, and a painting is to them the work of a painter, or a mere attempt at a reproduction of what the painter has seen: and, with a full appreciation of the short-comings of human nature, they realize that the painting is defective as an attempted reproduction of what the painter has seen. Such people, supposedly of a very practical caste, themselves see things just as they are and want them reproduced with the utmost precision, and consider a camera with a lens apparently free from aberration as eminently superior to any painter. Such people grow ecstatic as they view a photograph of the tree in

their own yard through a magnifying glass, and recognize the very leaf they have known so well that season.

Comparing the processes of painting and photography: The photographer arranges instrumentalities, and results are accomplished by means of the light rays and chemical affinity, wholly apart from himself. Aside from mere executive skill, a photograph shows nothing of the photographer, and this is said with the full appreciation of the artistic value of grouping and arrangement. The thing painted must always pass through the mental laboratorium of the painter, and to a greater or less extent partakes of the individuality of the artist. It is thus easily seen that no artist can reproduce precisely, and no photographer can fail to do this.

Which is the superior process, painting or photography? This is not the issue we desire to raise. It is not the superiority of one process over the other, but the distinction between them that is here desired.

A painting is the means of expressing what is in the mind of the painter, and its style is always characterized more or less by his peculiarities. The painter who attempts to delineate a hand, for example, and endeavors to copy a model accurately, or to make an absolutely truthful copy of a tree, is in error. He is losing time and failing of the accomplishment of his endeavor. He should use a camera.

Another thing, nature is never systematically nor consistently beautiful, and invariably falls short of ideal perfection. So the painter, working from the impressions of the most beautiful parts of many trees, paints an ideally beautiful tree; and in this way he should always idealize and never copy. Pictures thus come from the mind of the artist, and exhibit a completed thought.

The drift of these reflections is apparent, and applies to the attempted artistic use of the camera. Suppose, for example, that the camera user has devloped an ideal landscape in his imagination—rolling hills, partly cultivated, with background of wooded slopes. For giving life to the scene, there should be certain figures who have some relation to the scenery, engaged in some occupation in the fields. The costumes and attitudes of the people should be consistent with their surroundings, and the whole scene should have an artistic unity. Were he an artist, he would create this scene with brush and colors; but, armed with the camera, he must be content to reproduce and patiently search out the original which most nearly conforms to his ideal. Then he must exercise further patience and judgment in selecting the proper moment for making the negative, when the lighting is correct and the figures are in happy attitudes. In short, unable to modify nature, the camera user must possess a keen appreciation of pictorial values.

The accompanying scene from Sullivan County, New York, is an admirable illustration of our thesis. Here is such a landscape as an artist would employ. The leading idea centres in the life group,

Engraved by
Beck Engraving Co.,
Philadelphia

By F. L. Fieger

FALLING WATER

and they are in complete artistic unity with their surroundings. The camera in this case has most clearly approached the function of the artist.

But it fails where all artistic attempts with the camera must fail. It is reproduction, and is not a happy blending of artistic excellences. While the oxen could scarcely form a finer study of the brute life, the chain trace from the yoke is in a bad position, as well as the harness to which it is attached. The gear is in bad adjustment, and the horizontally tense chain is like a geometrical line bisecting the beast. Pass a plane through the rim of each hat, the man on the wagon, and the boy in the foreground, and they are parallel with one another, and the chain just discussed. All are in geometrically excellent relations; but as this is meaningless in the life of the ox and the man, it is purposeless and inartistic. The attitude of the little girl could scarcely be improved. Taken as a whole, it is a beautiful and touching scene, and shows keen artistic appreciation on the part of the photographer, whose courtesy in permitting the use of the print the writer desires to acknowledge.

THE BEST PLATINUM PROCESS

By J. Joé

(Translated by Henry Dietrich)

THE well-known excellent results obtained in the platinum process elevate it to one of the most eminent and artistic photographic printing processes. Still, it is surprising that just this process meets with so little consideration, and the question naturally arises, What is the cause of it?

The answer might be that the technical part of the process is not sufficiently known. Platinum paper is relatively dear, and requires an extremely careful storage and treatment, if faultless results are to be obtained. For this reason, and with regard to the negatives to be applied, many have made their own paper. Many defects can be avoided by so doing, but the question arises at the same time, How shall I prepare the paper, and which platinum process shall I use?

The cold process, which furnishes very good results, predominates, as a rule, to-day; but with regard to the durability of the paper, particularly in southern climates, and to the brilliancy of the print, it is surpassed by another process, the one with platinum in the developer. This process on account of its advantages may be designated unconditionally as "the best." The production and the treatment of the paper are very simple, and can be executed in the following manner:

The plain paper should not contain glue or gelatine in its manufacture, but resin, because the animal glue acts too much upon the tone of the picture. The necessary preliminary preparation is done with boiled arrowroot. The paper should be coated uniformly, but thinly, as otherwise the picture will float off during development.

The sensitized solution for medium dense negatives consists of:

A.—Oxalate of iron	20 grams	or	300	grains.
Oxalic acid	2 "	"	30	"
Oxalate of lead	1 "	"	15	"
Water	100 c. c.	"	3.3	ounces.
B.—Bichloride of mercury	5 grams	"	75	grains.
Water	100 c. c.	"	3.3	ounces.

Mix 25 parts A with 1 part B.

The coating of the solution is done with a soft, flat brush without metal mounting, running the brush first lengthwise of the paper, and then in an opposite direction. The drying should be done without any artificial heat. To facilitate the coating, the solution may be diluted with water. The printing is done best in a well-diffused light, and the originating iron picture is very clearly visible, and better than in any other platinum process. Particular care against moisture of atmosphere is not necessary, as even the printing can be done on moist paper.

The prints may be developed at once or in a few days. The developing can be done with the ordinary oxalate solution, 1 : 3, and platinum addition, as also with the oxalate phosphate developer.

In the latter case, take 20 c. c. of developer consisting of,

Oxalate of potassium	100 parts
Phosphate of potassium	50 "
Water	1000 "

and add 2 c. c. of a solution of 1 gram of potassium chloride of platinum in 6 c. c. of water. This mixture is sufficient for a sheet 50x60 cm. (19x24 in). The development is done by floating, or by applying the developer with a brush. In the latter case, 5 c. c. of glycerine is added. Fixing of the picture is done as usual, in water acidified with muriatic acid. The pictures, after drying, are extremely brilliant and clear.

Waiting for the Starting Gun — *By Geo. D. Pratt*

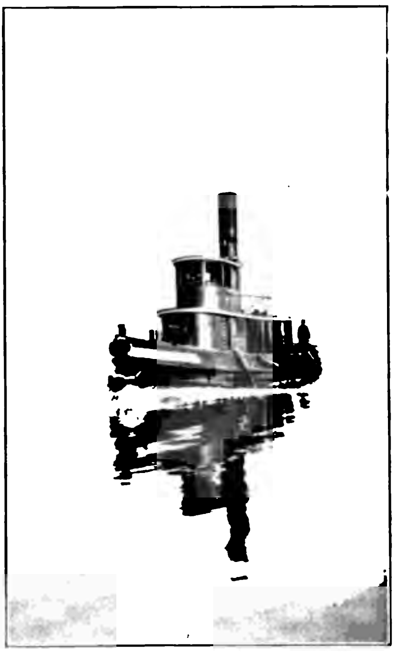
ODDS AND ENDS

By R. A. R. Bennett, M. A. (Oxon)

(Thirteen years Secretary of the English "Postal Photographic Club")

The Carbon Process.

BEGINNERS in the carbon process often find a difficulty in successfully manipulating the "safe edge" which is required to enable the print to peel off the material acting as temporary support in the double transfer process. There are two methods usually employed: One is to paint around the edge of the negative on the film side or glass side with some black opaque varnish, which prevents the light from acting round the edge of the paper. The other is to do the same thing by means of slips of opaque paper, e.g., lantern-slide binding strips. Neither process is wholly satisfactory, since the varnish cannot be got off the film side easily when not wanted, and the paper rarely sticks well enough, coming off in patches, which makes the mask uneven. The method I have to suggest is the employment of separate pieces of glass—old negative glasses will do—on which black paper is stuck around the edges. These are then used as masks to place in front of the negative to be printed, the paper next the glass side of the negative in the printing frame. This can be removed instantly, and in no way interferes with any negative when wanted for ordinary printing — gelatino - chloride paper, etc. Clouds can also be easily printed into a landscape by this means, putting the glass provided with the mask in exactly the same place, the cloud negative being substituted for the other, and the landscape shaded during the printing in the usual way. If this is done carefully, there will be no sign of any juncture in the resulting picture.



By F. M. Ingalls

Another difficulty is the preparation of the substance acting as a

film of collodion, by painting it on, or pouring over it a solution of collodion in ether. There are several objections to this process, the collodion in ether. There are several objections to this process, the film of collodion being easily damaged. I find that the following answers well: Take a wide-mouthed bottle and put into it a small quantity of white wax. Pour over this a small quantity of turpentine. Leave it to digest for some time, and put the bottle in a warm place; for instance, before a fire. Shake till entirely dissolved. When cold again, it ought to be a clear white pomade. Now, with this pomade you can anoint the surface of the opal or other temporary support, putting on a fair quantity, leaving it to dry, and then wiping off any excess with a cloth or flannel. The carbon prints will peel off this with great ease, leaving a good matt surface, if ground opal is employed.

Enlarging.

Many workers find it a difficulty to keep the paper perfectly flat. If pinned down, it curls at the edges. If fixed in a framework, at the edges, it rises in the middle and the picture is out of focus at that part. My plan is to use an additional sheet of perfectly clean glass in front of the paper. This keeps it absolutely flat. It can be supported on an easel by a framework, or pins at the sides and bottom for it to rest upon, or in the usual double back of an enlarging camera. In the latter case the paper goes between the ground glass and the extra sheet, with its film side, of course, toward the latter, and is placed there after focusing has been accomplished. The exact place for it can be fixed by means of strips of white paper fastened around the required space, in which space the amount of the picture required to be enlarged is made to fall.

Dark-Room Lamp.

Many amateurs who get pale, flat negatives with films where no portion is clear, wonder why their plates or camera do not give such bright pictures as those of other workers, when they ought to put the blame upon the developing lamp, which is the cause of their trouble. For the light itself, either a gas-burner or an oil-lamp that will turn up and down from the outside is the best thing, failing, of course, electricity. I recommend that the front pane of the lamp should be a good-sized one, and have two panes of ruby glass, one inside the other, with a space of about one-sixteenth of an inch between them. When very sensitive plates are being developed, a piece of ruby fabric can be slipped between the panes, which may be removed when developing bromide paper, etc. In this way you can get a good light and perfectly safe. A lamp with all four sides of glass is much the best, as it gives a good light all over the room and not only on the plate. A shade of cardboard fixed by wire over the front of the lamp, so that it can be easily lifted off when not required, is a great saving to the eyes, for much staring at the red light must be more or less injurious.

Engraved by
J. Manz & Co.,
Chicago

By Emanuel Tanenbaum

A PORTRAIT STUDY

Isochromatic Plates.

Those who wish to use these with a yellow screen can fit one to their camera with the greatest ease by simply making a circular rim of cardboard just the size to slip inside the lens hood. On the edge of this can be fixed (by means of marine glue or other cement) a circle of the yellow glass required. This can be easily slipped out when required, and when in it does not interfere with the action of the cap outside the lens hood, or the use of a shutter.

Rolled-up Prints.

When prints on gelatino-chloride or albumenized paper are dried by being squeegeed in contact with ferrotype plate or matt surfaced opal plates, I find it pays best to pull them off gently (beginning at one corner and stopping at once if the print shows signs of not being perfectly dry), as, if left to fall off of themselves they will roll up, whereas if pulled off they lie perfectly flat afterward. This curling up is one of the greatest worries that the amateur photographer comes across, as it necessitates all his prints being unrolled every time he wishes to find one, and spoils them for insertion in the "slip-in" type of album or mount. Such rolled-up prints can be straightened in the following way:

A Southern Ford *By S. Orlando Trippe*

Take two large pieces of blotting-paper and lay them flat on a table. We also require a flat-edged ruler or paper-knife. Put each print face downward on the blotting-paper, and rub from the centre to the end with the edge of the ruler or paper-knife, using an even but firm pressure. As you pass the paper-knife along from centre to edge, pull up the other end in a vertical direction. When this has been done from the centre to one edge two or three times, turn the print round and do the same from the centre to the other edge. Take care, of course, not to pull up the print so violently at the end not being pressed as to split it. After a few turns of this treatment you will find the print lies quite flat, and it will not be likely to curl again in the course of its subsequent career.

THE WASH-BOX

By O. G. Mason

THE subject of this short paper may have become rather a worn one. I am quite sure that many boxes have been completely worn out in my own practice, until I have concluded that the old saying of our English friends about being "penny wise and pound foolish" might well be applied, in a somewhat modified form, to the photographer who seeks to save money by using cheap wash-boxes for his negative work.

Of all items of foolish expenditure for photographic apparatus for constant use I would place the wash-box made of sheet zinc at the head. If I had more thoroughly studied the chemistry of zinc, and its weakness in resisting the attacks of the very weak sulphuric acid which reaches such a box from the hyposulphite fixing-bath, either for plates or prints, the manufacturers of zinc wash-boxes would many years ago have had one customer less. To put the whole matter in a few words, zinc is oxidized by water, and oxide of zinc is soluble in hyposulphite of soda. The weak remains of the fixing-bath eat up the apparatus made of zinc.

After furnishing a large quantity of such food in my chemical room, I decided upon a change. The accompanying illustrations show the form in which it was accomplished. The material used is sheet copper, about one thirty-second inch thick, or 26 gauge. Of course, the box may be made of such form and size as may be best suited to the user's purpose. The one which I use most frequently is made to take 14 x 18 plates, and all smaller sizes fitting the various racks used in it. These racks may be made of wood, copper wire, or other chosen material.

Fig. 1

To meet the requirements of the various advocates as to the proper direction of the inflow and outflow of the washing water, the construction is such that the current may be directed in several ways at the same time, or in one of several.

Fig. 1 shows the entrance pipe at the left-hand upper corner. This outside pipe connects with a vertical inside pipe, which delivers the water near the bottom of the box, and its exit is from the pipe at or near the corner of top diagonally opposite from the inflow.

Fig. 2 shows entrance at right-hand upper corner, while discharge may be at left-hand lower corner, or by adjusting stop-cock a part may be discharged at left-hand upper corner.

Fig. 2

Fig. 3 shows entrance at left lower or upper corner, and discharge at either upper corner, by turning down swivel joint at upper left corner. The inflow and outflow are under easy control by stop-cocks, and pipes are provided with taper nozzles suitable for rubber hose.

Fig. 4 shows the interior shaped ribs, which prevent bulging of the box from pressure of water when it is full. In order to make the form of these strengthening ribs more distinct in the cut, I covered them with white cardboard, which gives them the appearance of being about four times larger than they really are.

After two years' use my copper wash-box is as true in form as

Fig. 3

Fig. 4

when new, and shows no sign of erosion. A heavy copper wire is inclosed in the sheet-metal arond the outside top edge of the box.

To my brother workers I would say, Get a copper wash-box, and be happy!

A LOST OPPORTUNITY

By James B. Carrington

(Illustration by the Author)

THIS is a word or so about the photographs I didn't get and the cameras that are no more, and incidentally a true story of the adventure of a seeker after the picturesque. With rest as a first consideration, and the tonic effect of a voyage on blue water as a prescription, we embarked for the far shores of Newfoundland. The sailing time, with a day's stop in

Halifax to get acquainted with Tommy Atkins, covered about a week each way, and our intentions were to pass the greater part of that time on the rug-covered laps of our steamer-chairs. No man, woman, or child who has ever meddled with even a press-the-button picture-taker, or breathed the air of an oil-befouled bathroom dark-room in developing, could have failed to anticipate the possibilities that such a trip offered.

Life on the ocean wave, the ship and her crew, bits of character, heaving the lead—and whatever else might come up—whales, schools of porpoises, passing vessels, and what not, were visions that our minds dwelt upon. We should get something different. Our equipment consisted of one 4 x 5 long-focus Premo, with a tried and never-found-wanting Goerz lens; a 4 x 5 Telephoto-Cyclo-Poco; and a 3½ x 3½ Kodak, just for fun and those pictures that had to be taken while the other fellow was busy. In the trunk that was in the hold were a gross of Ortho plates and a supply of films. We were prepared to take everything in sight, and a few others that "never were on land or sea." Icebergs were to be our special joy.


In the Fog

I never like to hurry, so we boarded the ship promptly a couple of hours before she left her dock in Brooklyn, and listened to the Wagnerian variations of the steam winches that were hustling in cargo, and smelled the smells that hover about the average city dock. Our steamer-chairs were located, and in our hearts was the joy of freedom that comes to most of us for two or three weeks out of fifty-two. As the tug pulled us out into the stream, the sun was sliding down behind the towers that break the sky over lower New York, and the sweeping web of the bridge hung a black shadow above us. It was too dark for a snap-shot, and the color, too, made one feel the uselessness of the camera for such a scene.

Out through the curving lane of shining, jumping water we went, through Hell Gate, where we barely missed the rocks that lead below, into the beautiful Sound. It did seem such a good thing! And we turned in that night content, our only uneasiness a doubt as to the honorable intentions of our stomachs when the ship began to roll. Day came early—it does when you get up to meet it—and we were on deck. I was, rather. She preferred to seek the seclusion of the stateroom until we passed Gay Head into Vineyard Sound.

Sunday was all right. Monday we ran into fog, and all day long, at regular intervals of fifty-five seconds, the automatic electric whistle blower kept up its dismal noise. We could not entirely rid

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New York

WINTER SUNSHINE

By Alexander Graham

our minds of the fact that fog is a dangerous proposition; but no one said a word. In the afternoon, some young chaps who had but recently recovered their sea-legs went forward with their banjos and had some fun. One of the songs, I recalled later, invited the captain to stop the ship and let the invalids ashore.

Tea came at six o'clock, and as I went below I noticed that the fog had thickened. We came on deck at half-past six. I had just wrapped up my chum in her rugs and lit my pipe, when, with a bump that nearly knocked me off my pins, followed by a grinding and racking sound there was no mistaking, we stopped. We were in the small boats in fifteen minutes, and in twenty-five the *Portia* was registered in Davy Jones's locker, thirteen fathoms down. Big Fish Shoal had scored another victim.

How we pulled blindly around in the fog, finally heard the breakers on the rocky shore, and spent the night, is "another story." The next day every one said we ought to be thankful that we escaped with our lives. We were; but I could not get over the facts that my *cameras* were gone—my clothes were an after thought—and that Newfoundland was still ahead. We went there, however, and I am going again some day, up by steamer, and back as far as Halifax by train. The railroad that has but recently been completed across Newfoundland runs through a practically unbroken wilderness, the ideal happy hunting ground of the sportsman with camera, rod, or gun. There are streams and lakes on all sides full of trout and salmon, and caribou come to the slaughter in pitiful numbers. Do your shooting with a camera. You will find your time fully occupied with scenery that words can only belittle.

THE RANGE OF TRIPLE MID-AIR KITE PHOTOGRAPHY

By William A. Eddy

WHEN three cameras supported by a whirling platform were sent aloft by me on May 30, 1899, making probably the first triple kite photographs ever taken in the world, I found that, while the cameras had a wide-angle lens to the extent of covering a radiation of twenty-five degrees of the horizon, the variation in the wind direction, which carried the kites to the right and left for about one-third of a circle, caused more than half a circle to be covered by the three cameras.

The three photographs herewith were taken by camera No. 1 of the three cameras which were pointed from a platform shaped like half a circle. Cameras No. 3 and No. 2 were respectively pointed

Bergen Point, N. J., Kill von Kull, Staten Island

Kill von Kull and Staten Island

to the right and left. Seven ascensions were made to a height of one or two hundred feet, and not exceeding three hundred feet. The positions of none of the cameras were changed, the different pictures taken by camera No. 1 being due to the varying positions of the kites. The kite cable supporting the three cameras veered about one-quarter of a circle, now flying toward the northeast and then again toward the southeast. It is, therefore, clear that three cameras should be radiated as much as possible, because the swinging of the kites will more than fill in the ground not covered, especially during the approach of very distant storms, which cause the kites to veer rapidly from right to left.

I think the

danger of fogged films can be obviated while pointing toward the sun by ranging downward steeply, and largely cutting out the sky, by so aiming the camera that the horizon line is like that in the one taken with the camera swinging just above the tree-tops.

Tree Tops of Bergen Point, N. J.
Constable Hook in Background

I find, in snapping three cameras from the kite cable aloft, that it is very difficult to snap them at the same instant, and that at present the rapid swinging of the kites prevents the continuity of the picture. I shall devise a more delicate apparatus, in which the shutters are operated by electric wires supported by very large kites.

The camera with the swinging lens—the Al Vista Camera—takes very nearly a half-circle at one snap; but I think that the use of three cameras will include even more horizon line, owing to the veering of the kites, while four cameras would take the entire horizon line with great variety.

As for the cameras, any good wide-angle lens camera, with a focus set beyond one hundred feet, would do good work. Special care in photographing the entire circle of the horizon must be taken to avoid fogging the films on the side toward the sun, as above mentioned. The reader is asked to make due allowance for these difficulties, in judging the photographs herewith.

CHARLES READE'S BIRTHPLACE

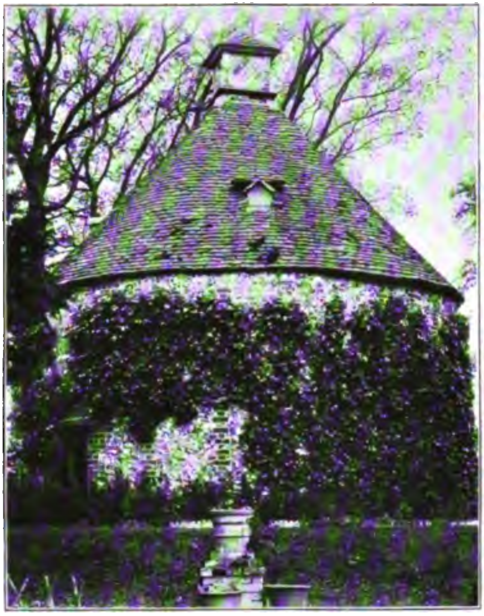
By S. E. Kelf

(Illustrations by the Author)

ONE of the curious developments of latter-day civilization, and perhaps rightly so, is, that eminent men who have passed away should have their birthplace regarded with a kind of veneration, and looked upon as a sort of shrine. If they had lived at the dwelling beyond their childhood, it must need add interest to the surroundings. So it must be in the matter of Charles Reade. The old manor-house at Ipsden, where he first saw the light, and the villages adjacent, give one a greater insight into the books written by the author of "Never Too Late to Mend." This residence came into the possession of the Reade family exactly three hundred and sixty years ago (1539). There is nothing remarkably striking in its exterior. Most of the ancient parts are completely hidden by the newer portions. Yet it is substantially as it was when the novelist came into the world. Under its roof he did a great deal of the writing when on good terms with his family. At other times he migrated to his college rooms at Oxford (being a fellow of Magdalen), or sought other

Manor House, Ipsden, Oxon

places in the neighborhood, or in London. At one period of his life he was hoping to discover the secrets of the old Masters of "Cremona" fiddle fame. On this he must have spent a small fortune. One of the windows to the right, overlooking the grounds, used to reek in varnish which was used in experiments in that direction. This dripping varnish from the newly made imitation "Cremonas" on to the lawn, and other matters, caused an estrangement with his father, the Squire. Attached to the older portion of the house is a fine old well, with a donkey-wheel, somewhat similar to that in Caresbrook Castle, Isle of Wight. There is also a remakably handsome staircase leading to the older portion of the manor-house. The photograph that accompanies this article somewhat dwarfs the magnitude of the building.


Round Dove Cote, Manor House, Ipsden, Oxen

Another interesting building is the round dove-cote, or pigeon-house, which is situated in one corner of the ground. It is very old, and bears initials of the Reade family—C. R., M. R., T. R., I. R., 1763. From the photograph some idea of this pretty little building can be gained. The writer understands that there is a clause in the lease that the present tenant has to keep a large quantity of pigeons; and as a matter of fact, about two hundred are kept, so that they shall not diminish below the minimum number. There is also a large fir tree covered with ivy on the lawn, which was planted by Charles Reade's mother on her wedding-day. The place is at a lofty spot, in the southern portion of the county of Oxford some five miles from a railway station. Of all these years, it is only within the last few of the three hundred and sixty spoken of that the place has passed out of the occupation of the Reade family. The present occupiers, however, are proud of its associations.

HALATION

By J. H. Harvey

NOTWITHSTANDING all that has been written and spoken during the last few years concerning Halation and the necessity for backing plates for all kinds of work, the number of backed plates used is still exceedingly small compared with the total plates exposed. In spite of the placing of ready backed plates upon the market at the same price as the unbacked plates, there are yet users who adhere to the old style, giving as excuses for their ignorance (or laziness) the facts that the backing material is difficult to remove, that it slows the plates, and is, after all, of doubtful value. If these wiseacres would only take the trouble to put backed and unbacked plates from the same batch to a fair test, I am of opinion that they would speedily become converted, especially if they chanced to use as their test plates some of the more thinly coated commercial productions, for it is worthy of note that the good effect of backing is not so plainly marked in the case of some plates as in others.

By E. B. Core

There are plates on the market on which it is scarcely possible to get a clean image if the exposure has been prolonged the smallest amount beyond what the full strength of the developer requires, whereas these same plates will work perfectly with long exposures when backed. The assertion that backing slows the plates is to a certain extent justified. Backing gives a cleaner image, and, as there is no light reflected from the posterior surface of the

glass, the image is not re-enforced by receiving, in addition to the light impinging on it plus that passing through it, such as is reflected from the back surface. The latter is absorbed by the backing, and is, therefore, lost, instead of being allowed to scatter itself in all directions, and thus apparently quickening the plate at the expense of the quality of the negative.

Admitting that, in some instances, for the sake of producing a pictorial photograph, it is considered advisable to have the wooliness and apparent fogging and running together of details which characterize a thinly coated plate, it cannot be denied that in the majority of cases a result of an entirely different nature is sought, and this can only be obtained with certainty by the use of a properly backed plate, unless multiple coated plates are used. As was previously remarked, some plates appear to be less in need of backing than others; but that all plates are the better for it, and will yield negatives of a superior character when backed, is doubted by none who have studied the matter and used plates under all conditions.

Let any person expose a plate for a given time on a landscape which has trees showing against the sky, especially should the said trees have shed their leaves, and then expose a second plate from the same packet upon the same subject for a similar time, one of these plates to be backed, and the other to be put in the dark slide, in the same condition as when purchased. After the resulting negatives have been fixed, examine them carefully, and note particularly the difference between the two renderings of the finer branches and twigs against the sky. In some brands of plates it will be found most marked. With such unbacked plates, where thick foliage comes against the sky, the upper edges of the foliage will all appear more or less veiled, the veil diminishing as the distance from the sky-line increases; whereas, on the plate which has been coated with a good effective backing, the line will be as sharply defined as it is in nature, and the whole of the detail in the negative will be much brighter.

Where commercially backed plates are unobtainable, they can be prepared without much trouble. Numerous formulas are given in the different ANNUALS for past years, and most of these will be found effective in all except perhaps the most desperate cases. The operation of backing, I can say from some years of practical experience, so far from being a messy or troublesome one, is simple, and, when properly conducted, there is no need for it to be productive of any mess. A dozen plates may be backed in a few minutes and stood in the rack in a dark cupboard for drying, which will take only an hour or two in ordinary weather.

The removal of any of the backings that are soluble in water is simple and expeditious, a wet sponge passed over the back of the plate being sufficient to move it, when it can easily be washed off.

When these points are properly grasped by photographers, backed plates, instead of being the exception, will become the rule among those who are anxious to produce the best work.

CAMP CAMERA

By Maximilian Toch

(Illustrations by the Author)

FOR three summers a unique camp has been quartered at Lake Mahopac, and the title of this article was the name of the camp. Originally there were three of us, but after a year the party increased, and the experiences of each year were profited by, so that our last camp was almost perfect.

The main features of the camp were the arrangements for photographing and developing. We had a dark-room tent, which was so constructed that it was "pitch black" at midday when the sun shone down upon it. It was made of a heavy grade of dull black oilcloth, with the black side inside, and the flaps fitted so perfectly that no light ever leaked through. We only developed at night, however, because we could then leave the flaps open and get air; and whenever we had to change plates during the day, the intense heat and the darkness were often characterized as being hotter than—a baker's oven.

Camp Camera

The sports of the camp were fishing and photography, and we had all the opportunity for doing both. The evenings were enjoyable, because we did not do what other campers did—go to bed at dark—but we had plates to develop, and prints to make, which frequently kept us up late.

We had plenty of company, and when it rained, which it did frequently we fished or photographed just the same for the reason that the camp was well drained and the apparatus was under cover.

We had all the pleasures of camping, with none of its discomforts,

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By Pach Bros

THE COQUETTE

as we had a cook and a boy to do the chores. Once a day one of us rowed to town to buy fresh meat, and the neighboring farmers

Dog Talk

supplied us with vegetables. At one meal each day we had fresh fish, and sometimes twice each day.

When the camp broke up, we each had a fine lot of pictures, and in the fall we exchanged views. The pleasant recollections of our

Superintending Dinner

summer's sport make us look forward to the next year with the longing of the schoolboy for vacation days.

A METHOD OF PLUMBING THE FOCUSING-SCREEN

By C. W. Canfield

THE practitioner of architectural photography finds much to contend with in the matter of getting true vertical lines. Even supposing the lens is really rectilinear, the irregularities of the ground where he is forced to perch his tripod, and the exigencies of raised fronts and tilted backs, are very demoralizing to the ordinary camera, as the results often show.

A simple device, which does not depend on the relation of the bed to the rest of the camera, was recently called to my attention by Mr. C. M. Darling, and seems to be worth recording.

It is merely the application to the focusing-screen of an ordinary cabinet-maker's "try-square," with metal blade and wood arm, and a small spirit-level. The metal blade is held against the focusing-screen, and the level placed on the upper edge of the arm. The verticality of the screen is then indicated by the bubble.

In the case of copying large drawings that are at an angle, the parallelism of the screen with the plane of the object can be secured by using a "bevel" or adjustable square; but the usual precaution should be taken of measuring with a cord from the lens to the extreme points of the object, rectilinearity in the other direction being insured when the measured distances are equal.

TONING BROMIDE PAPER

By H. Hands

I ONCE thought that everybody who had had any experience at all in photography knew all about this simple process; but I have lately realized that very few, comparatively speaking, have tried it, and some others there are who have tried it (so they say) and failed. I can think of no reason why people who have the suggestion before them every time they buy a packet of bromide paper should never trouble to work the process, excepting, perhaps, that they may have hazy notions of sulphur toning and

consequent want of permanency. Yet such people ought to know that the manufacturers would not recommend a process for their paper that would give proofs likely to fade as a consequence of the toning. Of course they get mixed, and overlook the fact that the "sulphur toning" of a P. O. P. print and the "sulphide toning" of a bromide print are not one and the same thing.

It seems almost impossible to me to go wrong in using this process. The maker is careful, and recommends mixing the hypo and alum by dissolving both separately, and then adding the alum slowly to the hypo. I do not doubt that he is theoretically right in this, but I throw both ingredients into the jar, and dissolve them together. Then they say, "You must alum the print before toning." I have nothing to say against this, but all I do is, as soon as the print is fixed, to transfer it directly into the hypo-alum toning solution, which is cold, and then raise the heat very gradually till the fingers will just bear immersion comfortably.

"No Place Like Home" *By S. Orlando Trippe*

One cause of failure I have heard of: An enthusiastic amateur got a zinc dish for the toning, and, when he saw his dish collapse, gave up the process as too troublesome! Enameled pie-dishes are what you want (not of necessity those specially manufactured for confiding photographers). They will stand the heat perfectly.

If a number of prints are done at the one operation, no one could justly call it troublesome, while the results are really charming when the prints have good contrasts. Different brands of paper will tone to different depths and shades of color, while the developer used for the paper has some influence in the same direction.

THE STABILITY OF DRY PLATES

By Charles E. Fairman

(Illustration by the Author)

WE hear from time to time many complaints of the imperfections of dry plates, and very often the statement is made that "the plates were old," in accounting for a failure that seems more or less unaccountable. I shall not attempt to convince any one that a bad plate is as good as a good plate, or that a plate which was defective when made will ever improve with age; but I believe that a plate properly made remains good for years, and that but little change takes place if the plate is properly taken care of. In support of this proposition, I wish to relate a personal experience.

In the summer of 1893, in company with friends, I made a trip in a house-boat, on the Chesapeake and Ohio Canal. The owner of the boat had built in one end of the cabin a very convenient dark-room, and had used the boat for several trips of a photographic nature. Before starting on our trip the owner of the boat offered for our use some 5 x 7 Carbutt Orthochromatic Plates, Sen. 27, which had then been stored on the boat for one or two years, and informed us that we were perfectly welcome to the plates, as he would have no occasion to use them for some time, and that he would rather have them used than left on the boat to spoil with age. While we appreciated the offer we did not make use of the plates, as we feared they were at that time injured from being exposed to the dampness of the boat during the winter

"Muggins"

and the extreme heat of summer. The owner of the boat allowed the boat to remain on the canal unused after our trip until 1896, when the boat was sold to a purchaser who had no interest in photography, and who, in making some alterations, removed the dark-room.

In the summer of 1896 one of the members of the party who made the canal trip in 1893 called on the purchaser of the house-boat, and during the call referred to our trip in 1893, and the very pleasant time that we enjoyed on that occasion. During the conversation the purchaser of the boat referred to some dry plates which he found in the dark-room at the time the repairs were made, and presented a box of plates to his visitor, with the remark that "the plates were all right, for he had opened one box, and none of them were broken." And so it happened that this box of plates which I had considered too old for use in 1893 came into my possession in 1896, as the person to whom they were given by the present owner of the house-boat did not care to spend his time in experimenting with such aged plates.

I did not consider the donation of much value, and the value did not rise in my estimation upon opening the box, for I found that the plates, either from heat or dampness, had become stuck together, so that it was almost impossible to pry them apart with the blade of a knife. Thinking that the plates were ruined, I closed the box and left the plates in my dark-room from the summer of 1896 to the summer of 1897. My dark-room is located in a cellar, and not entirely free from dampness during the summer months.

In the summer of 1897 I used some of the plates with a color screen, and developed them with a view to saving the clouds at the expense of the remainder of the subject, and found that the cloud effect was much better than I had expected, as I had considered the plates ruined from age and dampness in 1893. Upon finding that the plates had not become worthless with age, I saved the remainder of the box until the summer of 1899, when I made another successful negative.

I find upon inquiry of the manufacturer that the plates were coated January 1, 1891, so at the time of making the second exposure they were over eight and a half years old. I consider that the test to which the plates have been subjected is unusually severe, as they have been stored for more than six years in places wholly unfit for keeping dry plates, on account of the intense heat and dampness.

The query naturally presents itself as to the length of time plates stored in a suitable place where the temperature is uniform and free from dampness can be kept without injury.

THE PROGRESS OF THE PHOTOTOPOGRAPHIC SURVEYING METHOD

By J. A. Flemer.

THE phototopographic surveying method, originally devised and elaborated by Col. A. Laussedat, now Director of the Conservatoire des Arts et Métiers à Paris, is based upon the inverse laws of perspective, which were already known to J. H. Lambert, who refers to them in his work on "Perspective," published in Zurich in 1759.

The first practical application of these principles to map-making is generally ascribed to the French savant and hydrographer Beautemps-Beaupré, when he made a series of freehand sketches of the coastal belts of Tasmania and Santa Cruz while on a scientific expedition (1791–1793). After his return to France he constructed topographic reconnaissance maps of the explored regions which were based upon those outline sketches of the terrene. Beautemps-Beaupré frequently recommended this cartographic method to explorers, still little was accomplished by others until Arago (1839) called attention to the possibilities of photography when utilized in this direction by the topographer.

When Col. A. Laussedat first became interested in the study of iconometric mapping, he used a "camera clara" for obtaining the outline sketches of the terrene, but after 1852 he caused a "camera obscura," modeled after the one used by Niepce, with the addition of special devices for surveying purposes, for the execution of numerous experimental surveys, in which he was subsequently aided by Capt. Javary of the French Génie Corps. In 1859, after having perfected his method, Col. Laussedat announced the successful application of photography to surveying to the Academy of Sciences in Paris. Col. Laussedat's work in this field has been so complete that the guiding principles first enunciated by him still form the foundation of every phototopographic survey made at the present time.

By B. L. H. Dabbs

This method was at once pre-

empted by the army engineers of both France and Germany for so-called secret or military surveys. In recent years, however, phototopography has found a wider and more general application in nearly all European countries, in North and South America, in Asia, and more recently still in Africa. Among the principal workers in this field in France, besides the two already mentioned, we may cite Paté, Jouart, Capt. Carrette, Commandant Moessard, Dr. Le Bon, Commandant Legros, Mouchez, Vallot, and others.

The French Ministry of War in recent years has experimented extensively with balloon surveying and so-called "telephotography" (long-distance photography), both being well adapted to military reconnaissance and to locate hostile army corps with or without intrenchments and fortifications, especially since the general introduction of smokeless gunpowder.

Col. Laussedat's photographic surveying methods were soon adopted in Germany and Austria. It is even claimed by some writers that A. Meydenbaur, in 1858, while engaged with the mensuration of the cathedral at Wetzlar for the purpose of its renovation, had, independently of Col. Laussedat's work, conceived the idea of using photographs of the cathedral to construct the plans showing its actual condition at the time of the survey. Dr. A. Meydenbaur has published numerous articles and pamphlets on the subject of photographic surveying, and in 1882 the Prussian Government placed him at the head of the "Photogrammetric Institute" in Berlin.

Count Moltke as chief of the Prussian General Staff early recognized the value of photography applied to military and secret surveys, and the Prussian army, in 1870, had a complete phototopographic detachment in service, under the command of Capt. Bernhardi and Lieut. Doergens. Dr. Meydenbaur, Prof. Jordan, Dr. Doergens, Dr. Stolze, Dr. Finsterwalder, Dr. Pietsch, Dr. Koppe, Dr. Vogel, Dr. Hauck, and others have largely contributed toward the popularization of photographic surveying methods in Germany.

Dr. Koristka, while visiting Paris in 1867, met Messrs. Laussedat and Chevalier, and became interested in the photographic surveying methods. His subsequent photographic survey of the city of Prague is probably the first practical application of Col. Laussedat's method in Austria.

In 1890, a series of experimental phototopographic surveys was made, under the auspices of the Military Geographic Institute of Vienna, which fully demonstrated the superiority of this method for the survey of certain regions, and since then many engineers have applied photography to the surveys of inaccessible mountain districts in Austria. Among the more prominent workers in this branch of surveying in Austria we may mention Lieut. Mikiewicz, Major Bock, Lieut. Hartl, Capt. Hübl, Major Pizzighelli, the engineers Pollack, Hafferl, and Maurer, Prof. Schiffner, Prof. Schell, Prof. Steiner, Prof. Heller, and others.

The largest area surveyed photographically in Europe may be

found in Italy, where excellent results were obtained fully demonstrating the efficiency of phototopographic methods for the surveys of mountain regions of an Alpine character.

Although Prof. Porro's experimental work dates back to 1853, nothing of note was accomplished in Italy until Micheli Manzi, of the Military Geographic Institute, used some photographic views to supplement the topographic details of his plane-table survey of the region about the "Gran Sasso."

Chantry in the Beauchamp Chapel, Warwick
By James Gale

In 1878, General Ferrero, Chief of the Geodetic Division of the Italian Military Geographic Institute, detailed L. P. Paganini, Engineer Geographer of the Institute, to make some experimental phototopographic surveys in connection with the new topographic survey of Italy. Paganini's results were so gratifying that the photo-topographic method has since been used for the survey of the entire area in Italy situated above the altitude of 2,000 metres, areas below that elevation being surveyed with the plane-table.

Owing to the untiring efforts of Capt. E. Deville, Surveyor General of Dominion Lands, phototopography has been practiced with remarkable success in the Dominion of Canada. The method was first used, in 1888, for surveys in the Rocky Mountains in the vicinity

of the route of the Canadian Pacific Railroad; then for the topographic reconnaissance of southeastern Alaska, made for the International Boundary Commission, in connection with the delimitation of the boundary line between Alaska and British Columbia; and more recently for the mapping of the region about Dawson City (Klondike), and for irrigation surveys made in Canada.

The United States Coast and Geodetic Survey Bureau has repeatedly used this method for topographic reconnaissance surveys made in the Territory of Alaska since 1894.

STEREOSCOPIC WORK

By George Kilburn

NOW that the winter months and long evenings are with us again, many photographers—both amateur and professional—will be pondering in their minds as to what they can be doing at their pet hobby, or, if belonging to the latter class, what they can introduce to their customers and the public, to increase their work, as it must be very little they can do at this time of the year, owing to lack of orders and dull days. Many amateurs will occupy themselves in making negatives and prints from them by their favorite process, such as silver print-out, carbon, or autotype, bromide or platinotype. Some prefer making enlargements, and others make lantern slides their chief hobby, while a number of others devote their leisure time to stereoscopic work.

Fourteen Degrees Below Zero
By Geo. Y. Lewis

To those who are hankering after something new I would recommend trying their hands at some other branch of photography than what they have been working at. I have many times wondered why more amateurs do not take up the practice of making "Stereograms." To my mind, this is the most interesting branch of photography, as it not only gives a great amount of pleasure to myself and family, but interests equally most of my friends and others who visit us.

Those who have practiced stereoscopic photography know that they can obtain a great many subjects, and of an almost infinite

variety, which are suitable for stereograms, but which would not be suitable for ordinary photographs. The fact that this is so is easily appreciated if two pictures of the same subject are photographed, one with a one lens and another with a twin lens camera. The single picture will look flat and lifeless, while the double picture, when viewed through the stereoscope, will look full of life, every detail being apparent, and showing the scene in all its reality.

Another point in favor of stereoscopy is that the negatives are suitable for other work, such as lantern slides, enlargements, small prints for birthday, wedding, or Christmas cards.

I could say more as to the usefulness of this class of pictures, but will let this short article suffice for the present. Perhaps it may awaken some fellow camerist to the beauty and pleasure to be derived from this, to my mind, the most interesting branch of photography.

THE IMPROVEMENT OF THE AMERICAN LANDSCAPE

By F. C. De Sumichrast.

IT is said that a celebrated critic once remarked that the very outline of American mountains is vulgar and devoid of beauty. He did not say it, of course, but what he might well have said is, that a large class of Americans are steadily at work destroying and vulgarizing the fairest scenes in the loveliest neighborhoods.

No man feels this more acutely than the landscape photographer, who is constantly irritated by the degradation of choice bits by staring advertisements of stoves, soaps, and patent medicines. Instead of the vine-clad cottages of the Old World, the American artist has to submit to the hideous transformation of a house or barn, otherwise susceptible of entering into a picturesque composition, into a staring background for huge lettering proclaiming the invaluable prop-

By H. C. Close

erties of a drug or the superior advantages of a polish. The loveliest bits of marsh and meadow are rendered offensive by the erection thereon of enormous bill-boards, which no effort on the part of the photographer can relegate to a corner where they will be invisible. The rivers and lakes, the very brooks and mountain streams, are made receptacles for the detritus of picnickers and soulless tourists, who scatter candy-boxes and dirty newspapers over the turf of the banks, the bracken, and the underbrush, and the face of the rocks that are laved by the pellucid waters. Industry of another sort adds its contribution to the disfiguration of the glens and rifts—trees are cut down, and allowed to fall, leafless, bare, repulsively naked, in the current, and to anchor themselves precisely where their gaunt gray limbs will interfere most successfully with pictorial treatment of the "bit." The ubiquitous can, that has held captive the remains of the lobster, the salmon, or the green corn, the peach, the pear, or the apricot, protrudes itself everywhere, and asserts the supreme right of man's skill and man's utter disregard of loveliness to sully the face of Nature in her most secret, nooks and sweetest aspects.

A Wet Day on the Promenade *By Prescott Adamson*

Is it not time that some effort was made, not by isolated individuals or by critics sharp of tongue, but by bodies of people vitally interested in the preservation of natural beauties, to put a stop to this desecration? Patriotism, so-called, has become more rampant than ever. It has attacked the very flag of the country and turned it into an advertising medium; it makes day horrible and night a terror with the explosion of the devilish invention of the cannon cracker; it calls on all men to dub heroes those who have but done their duty, leaving no honor for the real heroes who have done what it is given to few to accomplish.

But is there to be no patriotic feeling of pride in landscapes that are as fair as any that exist? Are they ever to be sacrificed to the vandal advertiser? The telegraph and the electric-light pole are, no doubt, useful, but must they always be planted where they will do the most harm, when a yard or two farther away they would not destroy the perfection of the view? Within half a mile of the mountain seclusion where these lines are being written, there is as beautiful a scene as even the most crusty European may wish to

behold. A mountain stream tumbling over rocks, between green wooded banks, rich in bracken and flowers; the birch and the aspen, the maple and the fir, mingling their varied foliage against the cloud-flecked blue sky; and, for background, a noble mountain, lifting its bare head from amid a wilderness of wood, and its whole face bathed in the marvelous vaporous haze that captivates one in Cape Breton or in the Grampians. Right in the foreground, three or four skeletons of trees, cut down for some mysterious purpose, have been allowed to lie where they fell, as if in justification of the Calvinistic hymn. Around these, and on either flowery bank, old newspapers, yellower and dirtier than their contents even; a fringe of tin cans, horrible in their eviscerated and jagged condition of uselessness; and, towering in the very centre of the picture, a telegraph-pole, that might have been placed behind the trees six or ten feet away on one side. And this is no exceptional case. Any one can multiply instances of the same disfiguration from his own painful experience.

Who are most interested in the preservation of the numerous natural beauties of the American landscape? The whole nation is interested, or should be; but what is every one's concern is no one's business, and, if we wait for a national movement, we shall wait a long time; and, meanwhile, more horrors will be added daily, for the evil appetite grows by what it feeds upon, and the advertiser is always seeking new spots to deface with the brazen proclamation of his wares. It is the artists, whether with brush or camera, who must move those who are able to stay this evil. The photographic clubs that are wondering what they can find to interest their members, what novelty they can draw their attention to, might well start to improve the conditions in their immediate neighborhood. A campaign of artistic education of the American people is what ought to be undertaken. The fruits will be slow in coming, but they will come in time, and, if others reap where we have sown, there will be this satisfaction at least, that what could have been done by others has been done by us, and that those who come later will be grateful to their predecessors for rescuing landscape from the curse of the stove, the soap, and the tin can.

PHOTOGRAPHIC PREVARICATIONS

By H. M. Beeles

I WOULD not have the fraternity think for a moment that I believe in prevarication as a rule, and yet in some cases to falsify, as in the following, is profitable, and perhaps, sometimes commendable.

Back in the seventies I had occasion to copy a picture of a gentleman from a tintype. The picture had been taken several years

Engraved by
Suffolk Eng. Co.,
Boston

A SUMMER IDYL

By C. Chenery

before, and his children desired 8 x 10 enlargements as he looked when young. The gentleman in question had an enormous underlip, and the artist (?), who evidently knew nothing of lighting his subject (the position was good), had so posed him as to greatly exaggerate the shadows under the eyebrows, nose, chin, and the lip, and, of course, exaggerated the lip also. Indeed, the man had altogether "too much lip."

If I could remedy that, I could secure a very good order; so, telling my customer I was pretty sure it could be done, I went to work. Wet plates were in use then, and I made a fully timed negative, and filled up the objectionable shadows as much as possible by retouching, and then pasting French tissue paper on the back of the negative. I carefully re-enforced my retouching by stippling Prussian blue on to the tissue, proofing from time to time, until the work suited me. My customer and the children declared it a perfect likeness. I think it was, all but the lip, which to me appeared "altogether too thin"!

A German once came to me for a sitting. He said: "I haf been to two or tree galleries to haf my pictures taken, but dey all show my nose so bad I don'd vant dem at all. You see it vas dis vay: I fall in de voods, und preak my nose mit a handspike. If you can make me a picture vat don'd show dat grooked nose, I vants a dutsend; if you cand, I don'd vant any."

I told him I would try, so I gave him a sitting, having him look well to the left, as his nose crooked that way; then, having the right side well in the shadow, I made the negative.

"Ven will you haf dem done?" he asked.

I told him he could call in a week.

"Vel, if dey suit, I brings you lots of work."

The week passed, and he called with his wife, two grown-up sons, a daughter, and a sister.

I handed him the envelope containing the photos.

"Vel," he said, "I don'd expect dey'l suit."

I suggested that he had better look at them. He nervously took one from the envelope, and looked at it.

"Vell, you did! You did it!" he exclaimed. And he at once ordered two dozen more, and I made either three or four more sittings for them before they left the studio, and in the end about forty dollars' worth for themselves and friends.

Sometimes prevarication pays.

DISTORTED PICTURES

By Robert H. Bow, C.E., F.R.S.E.

SOMETIMES for useful purposes, and often to produce comic effects, it may be sought to reduce or enlarge the scale of a design or picture in one direction, compared with the scale at right angles thereto. There are various methods of producing this *regular* kind of distortion, a popular account of which has been promised by Dr. Moritz von Rohr, of Jena, so I shall here describe only one that suggested itself to me early in this year.

This method requires two operations at least: The first is to copy with the object-picture placed obliquely, as shown on plan by

Fig. 1.

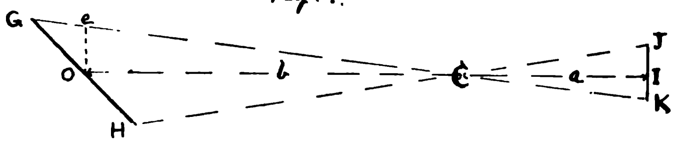
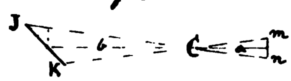


Fig. 2.



GOH in Fig. 1, where C is the lens, and JK the image or copy. We thus get a reduction of the horizontal scale compared with the vertical one.

But the vertical scale at J will be exaggerated compared with the vertical scale at K, and the image, IK, of one-half of the picture is less than the image, IJ, of the other half. The second essential operation corrects these irregularities, and is as follows: The photograph obtained from the negative, JIK, is placed in camera, as shown in Fig. 2, so obliquely and so distant that the ratio of CJ : CK of Fig. 2 will be = CG : CH of Fig. 1, and the desired result is got at *m—n*.

To secure fairly good definition, we must use a very small stop, and make a considerable reduction in size (see Appendix below). If the result so got would be too diminutive, we may resort to normal enlargement after one or both operations.

The obliquities of GH in Fig. 1 and JK in Fig. 2 are not necessarily equal. But, if in each the obliquity be made = 45°, the horizontal scale in *m—n* will come out half that of the vertical one; 54° 44′, gives one-third; 60° gives one-fourth, and so on.

There is a curious connection between the ideas involved in the

above and in a paper I read October 21, 1863, before the Edinburgh Photographic Society, on "How to take a Non-distorted Copy with a Distorting Lens."

APPENDIX.

The Degree of Confusion at the Sides of the Images.—We may fairly assume, in considering this, that the size of the stop is always in the same proportion to the length, a. This will give a constant angle for the pencils of light illuminating the image.

Let $F =$ focal length of the lens.

Since $a = Fb/b—F$, by differentiating we have,

$$\frac{da}{db} = \left(\frac{F}{b—F}\right)^2 = \frac{a^2}{b^2}$$

That is, when the centre, O, of the object-picture in Fig. 1 is in correct focus at I, the longitudinal error of focus of G at near K will be approximately $= Ge \times a^2/b^2$; and the diameter of circle of confusion representing a point will be

$$= Ge\frac{a^2}{b^2} \cdot \frac{\text{diameter of stop}}{a}$$

But in estimating the imperfection of the image, we must take its scale into consideration. We must, therefore, divide the above by the size of the image, which varies at a/b, so that the degree of imperfection in the case of Fig. 1 is expressed simply by $Ge \times$ diameter of stop $/b$. If, for example, the stop $= a/100$, the imperfection varies at $Ge \times a/100\,b$. In the case of Fig. 2, Je is to be substituted for Ge.

PHOTOGRAPHIC GHOSTS

By C. B. Talbot

THE keen eye or touch will see or feel the presence of "spooks" in the new century as in the past. They will have the same charm on cloudy nights or in the mists of obscurity as ever, because we like to meddle with white sheets and the tripods of witches, just to see if they are so; ever waiting for Pandora's open box, even though one of the evils fall on us. It is well to assure the timid of the harmlessness of these things, although uncanny, however devised. But here they are, in our photographic dark-house, and not a peep of day to discover them.

Perhaps the most common of these evil presences is found in the developer, while watching and waiting for some new creation to appear. Not the one we expect, but the unexpected, alights on our web of fancies, when the beautiful thing we had hoped to see comes out in fogland, with here or there a tree or chair below the vacant

field. Probably, if we had divided the time of exposure by two and doubled the water of the developer, adding a drop or two of patient bromide, the fairy would have alighted on that plate, and not the fog from the coast of ghostland.

On the next, summer evening was never more beautiful: the sun at rest below the golden clouds; the long shadows of a few moments before are gone, absorbed in the mild yellow light from above. Click goes the shutter well for four o'clock—four times too much for noon, four times too little now. Half an hour in our lamp-room, and not even a "ghost" on the clear glass.

Another: Off toward the sun we spaced the air and field; a shaft from his golden rim found a resting-place on a bright spot of metal near the lens. After, as we watched, a diamond kite and foxy tail spread over the shadow of our only rock in a weary land—of the day

By E. S. Strout

before. That ghost would have been "downed" if we had blackened the metal and used a sunshade.

The next time: Our "spooks" came in twos and threes. We had some pieces of houses, a window or two, superimposed on our principal building. How could such things be? Three, four pictures on one plate! One was all we needed. Investigation revealed that we had drawn the slide, and waited until a stray dog and his master walked by the scene. That morning a new lens had been put on the box, covering less of the screw-holes of the old one than it should, which gave us a three-barreled pinhole camera and lens combined—an improvement for which we did not ask a patent! As a result, a line of good, real live ghosts! Sometimes we were not so successful from the use of a hole in the corner of the bellows or a little light from the end of a warped plate-holder. We often wondered why the old camerist always covered his machinery up with black cloth, wrapped in warm clothing, until the shield was drawn and closed again. While not a handsome habit, we found it saved

Engraved by
Wm. C. Gage & Sons,
Battle Creek, Mich.

TURMOIL

By C. Chenery

some heartaches, as we have seldom known glue and a cabinetmaker to remain lifelong friends. When they parted, we usually found it out, as, for instance, when our neighbor left his leather box on the beach while the tide came in. Then we had a parting when the mountain dews dampened the roll-holders, when we, stubborn and strong, parted the film in the middle, as it would not otherwise be moved! Then it got damp on the surface—a stripe on its face from end to end. Though we did not see that ghost until we got the "roll" home from Klondike, after a year's waiting. We do not have that kind of film any more, but the cut ones, like leaves in a book, or the magazine sort, loading in daylight from a box—when we go in "a far country strange things to see." In that way we do not see so many strange things when we get them home.

But then, the real ghosts—a departed face on the glass with your best friend. There he is, old Shamrock and yours, separated by the bridge of death for many years. That is getting near enough to the supernatural for any one. We had an old negative of Shamrock,

By H. W. Scandlin

which stood on a sunny shelf for many a year. He being dead, and his friends, too, we put them in the acid pot, along with the piece on which we afterward made Thistle. We rubbed it with alcohol and rotten stone, dressed it up in a new collodion coat, bathed it in silver, and stood it up before Thistle. When we washed, ironed and hypoed it, there stood Shamrock just beside Thistle! Did you ever see an old sign rubbed off a window? There are the letters still, though darker than the rest. So, like it, while any of the glass remains, Shamrock still lives! Thistle objects, and will not pay for the pictures. So you lose them both in the night of oblivion, not being careful of "the immortals."

Then you put in your plate-box, between your plates, a slip of printed paper, on which you wrote "Castle Rock." When you developed it, you had that and all the printing, "large as life and twice as natural," where you did not wish either—across the entire piece. Then you took some white paint and marked the shield

" No. 5," which when you drew it you turned inside. You developed, and then that lordly " No. 5 " stood out in bold array in the middle! If the spooks do not possess such things, then who does?

But there is a knave around the corner willing to fish a penny from any pond wherever found. There is a seance in the neighborhood determined to have " spirit photos " at their next sitting. K. is commissioned to bring in the paper " spirits." So he sits up a bride of many years ago, or " baby blue " makes a slight exposure on the plate on which Mrs. Medium is to sit. A little candle-light in his dark abode before an extra camera, is sufficient. A part of the face and shoulders of white will do; only a little, just enough to be discerned—when Mr. Fakir has succeeded in making a real spirit photograph. It will be all the better if Mrs. M. will give him the picture of some one known to them all, who has passed on before.

The illusion of making a man play chess or cards with himself, write a letter and look over his own shoulder at the writing, stand beside or behind himself, have a friend or two help him at the mischief, and a hundred other things of this nature, can be done in the camera neatly. Ghosts can be introduced, or any fake desired, by having two or more folding-doors in the back of the camera, near the plate-holders. Open one half, and expose the plate; put on the lens cap, and open the other door—when the same man can sit or stand, as desired, or a new person be introduced or left out of the picture, as the case may be.

There are a number of ways to fix these doors. The simplest is a slide of pasteboard, which will cover about an eighth of an inch more than half the camera (depending on its distance from the plate). If too wide, narrow it until the lap is imperceptible when developed. The division line may be horizontal, vertical or oblique. The vertical line is easier to work, as it requires only the sliding from side to side, which may be done with a thread, or the plate-holder may be taken out and the card slipped to the other side, care being had not to move the camera. Should it be moved slightly, if the background and figures are plain, it will not be noticed, unless some part of it, as a table-top, extends into both parts of the picture. A handier way is to have the doors hinged at the side and opening in the middle, each kept shut by a small spring, opening one or the other by a thread, pulled out and fastened at the side, while exposing. Where the figures are complicated, as a chamber window or balcony opening into a court, more elaborate mechanism is required, planned on the same principles.

Some years ago, the Indians of Southeastern Alaska were shown some of these " fakes," and ever since they have been fearful of a camera, as, just after that the smallpox appeared among some that had their pictures made, and they attribute the whole misfortune to it or the dark box that can make such lies. Now it is difficult for a stranger to get their pictures. So, black-box men, beware how you impose on a confiding public!

A long list of spooks may be found among the chemicals we use. Several of them have appeared to all of us, uninvited. When they are gone, you may say something unkind of their memories. "Oyster-shells," "pinholes," "frills," "mottles," "stripes," "spots," "stars," and garter-snakes of all sorts and many tribes we cannot mention, have invaded the glass house at one time or another, and will continue to live there high above the stars when we are done with it. The poor man who manipulates plates is continually falling among thieves, and these nightmares, unawares. From most recitals, how dreadful a thing is a box of plates! What may they be or not be? What grief, what joy, or pride before a fall! Perhaps photography is of that instructive nature which reaches to all ages—certainly to those to come. How we would like to see Caesar on his way to Asia, just as we now see our boys in cold, black ink leaving Tacoma, and landing in Manila, after a month of rolling on the ocean, and in the mud chasing Philippinos! Glory is cheaper now than it used to be; but most can endure their share of it, caught on the park, peak, or shore—helpless before sprites who pull strings, or put your head on the wrong shoulders, or who put your grandfather on the front porch among the spirits of the departed.

CHASING A PRAIRIE FIRE

By C. N. Whittaker

(Illustrations by the Author)

DURING the last few years the farmers of the Western States have been troubled by a new weed, the Russian thistle. It is about the shape of a bushel basket, but often many times larger. In the fall the root is broken by the wind, and all during the winter the weeds are blown across the prairie, scattering the seeds, and finally collecting in the corn-fields in such quantities that the farmers are compelled to burn them before they can go through the fields with their plows.

The town of Imperial, with its three hundred inhabitants, is scattered over a territory a half a mile wide and a mile and a half long. It is situated on a little stretch of prairie among the sandhills and prairie-grass, and weeds grow between the buildings, in some instances coming to the very doors and outbuildings, so the dangerous location of the village with regard to prairie fires may be readily understood.

Last spring, two brothers, living southwest of the town, allowed their fire to get away from them. It was started in the morning, a time when the wind often rises, but this is something that the Western farmers cannot or will not learn. A brisk breeze from the north

drove it across a tract of country sparsely settled, but used as pasture-land for several thousand head of range cattle. Those whose grazing-grounds were in danger were the only ones who experienced any uneasiness; but about one o'clock the wind changed to the southwest, and, as the clouds of black smoke began to roll up among the sand-hills, men hurried down the street with wet grain sacks or shovels in their hands. Occasionally a horseman rode out a few miles, reconnoitred, and came back. The two dray-wagons of the little place rattled out with plows and men, and began a fireguard just outside of town.

As the fire came near, the people became more excited. Two or three carriages raced back and forth carrying men to the scene of

Behind the Prairie Fire

action, and horsemen dashed across the prairie bringing news as to where the fire was burning. Anxious to try my luck on a real live prairie fire, I sent to the livery barn for a team, and, three of us in the buggy, we galloped toward the place where the smoke was thickest. The driver seemed to have caught the general excitement, and gave no heed to bumps and ruts, turning corners in such a manner that we were forced to sit heavily in our seats to keep the four wheels of the buggy on the ground. The third member of our party was a married man, and thoughts of a possible widow and a large family of orphans made him somewhat timid as we neared the conflagration. The nearer we approached the flames, the more his courage failed him, until it disappeared entirely and fright took its place.

When we were about a mile out of town, the fire seemed to be

just over the next rise of ground, so I directed the driver to take us to the top of a little knoll, took out my tripod and camera, got ready for business, and waited. A brisk breeze was coming to us from the fire, which was crackling and roaring about three hundred yards away. The married man became frantic, the horses snorted and pawed, and the driver called to me to hurry up. "Click!" The plate was exposed. Into the buggy I climbed, and down the road we raced, with flames close behind us. Then the wind changed a point, and the flames went off in another direction.

Down by the village the men were "backfiring"—starting a fire along a road or furrow which it could easily be kept from crossing, in order that it meet and check the prairie fire. Here the railway

The Fireguard

section gang was working with its customary slowness, and the road-master was vainly trying to "get a move on 'em." Twenty other men were working here, but the section gang was most effective, for, though they obeyed him slowly, they had but one boss. The rest were all bosses.

The daily train should have left at one o'clock, but the conductor had received orders to work with his crew to protect the company's property. The spruce brakeman, known to all the unmarried ladies along the little branch line, the handsome mail clerk, who refuses to flirt, the engineer, and the fireman were all laboring amid the smoke to see that no stray tumbleweed carried the fire past the guard.

After making an exposure, I crossed the fireguard with the intention of catching the head-fire as it went through some tall grass.

Choosing a good location, I planted my camera and waited. The air became hotter, the smoke thicker, and finally the flames struck the tall grass. Great columns of black smoke rolled into the air, and through the roaring and crackling I could faintly hear voices calling to me to "get out of there!" I did not wait to study the ground-glass, but focused by the figures on the front of the camera, pointed it by guess, fired away, and ran for it. Of course it would have been a lovely negative, for I forgot to draw the slide.

When I got back on " dry land," I noticed that the men looked at me from the corners of their eyes as at one who, if not properly watched and cared for, ran a great risk of getting his fool head burned off. So I walked around on the burned prairie, thinking to take the flames from the rear; but again the wind changed, so I stood with the camera ready, and watched the little wreaths of smoke that rose from the blackened ground. Half a mile south of me the smoke was being blown east, while where I stood I was enveloped in a cloud going west. Across a little valley the fire was burning with great vigor, but in my locality the progress of the flames was very slow. An occasional whirlwind hurried across the valley, carrying a column of black smoke and cinders, but none of them were large enough to photograph.

Suddenly the wind veered to the west, and a hundred feet from me the red flames sprang high into the air, while the reports from the burning grass and weeds sounded like an incessant volley of pistol shots. Higher rose the flames, and louder was the roar. I knew that the sudden gust of wind would last for a moment only, and, turning the camera on the tripod to bring the flames within range, I made another exposure. The wind ceased, and a gentle breeze coming from the east nearly suffocated me with smoke; but I took the camera under my arm, and moved to a spot where, two minutes before, the tall dry grass was standing; now the ground was black and hot.

Half a mile east of me a huge backfire was burning, and through the smoke I could catch an occasional glimpse of a line of men standing behind it, whipping the ground with wet rags.

Birds flew from the grass, and hawks and buzzards sailed through the smoke as though waiting for their food to be cooked. Sharp watch was kept along the road for rabbits, which escaping through the flame might carry the fire toward the town. Many ran out, but I saw none on fire.

On the west and south blazed the prairie fire, while on the north and east burned the backfires; thus on all sides the fire was running slowly toward the centre. The wind changed to the southwest, and instantly the entire line of the prairie fire sprang into action. The roar was incessant, and the landscape was enveloped in clouds of white smoke.

Not a blaze being in sight, however, I exposed my last plate, folded my tripod, and, like the Arab, silently stole away.

HALO DUE TO THE REFLECTION OF LIGHT—MEANS OF AVOIDING IT

By Charles Gravier

IT often happens, when one photographs, with extremely rapid plates, interiors, narrow streets, or alleys, with thoroughfares wherein the light strikes very forcibly, that after development the highly lighted parts of the plate are surrounded by a sort of stumping which transfers itself to the positive proof by a degradation of tone analogous to that which is produced when the negative is retouched during development with a brush by means of a quick reducer. This is known as a halo of reflection, to distinguish it from the other kinds of diffusion produced by light.

The halo due to the light's reflection on the back of the plate is frequent, but it is about the only one that can absolutely be avoided. It suffices to cover the back of the plate with a substance which, in absorbing the light that traverses it, stops its reflection. It is admitted that this substance should be in optical contact with the glass; that is to say, there must be no interval or air interposing.

On the Nile *By Geo. D. Pratt*

Much has been said regarding the efficacy of tissues (cloths, velvets, etc.), and of the colors of papers (red, black, etc.). We have shown by incontestable experiments, as they have been worked simultaneously and on the same plate, that all these applications leave the halo due to reflection. We have also verified that all colored varnishes, all colored pomades, all colored coatings, are efficacious and excellent, if this air can be suppressed. But among the latter there are some inconvenient ones. To start with, if the sensitized plate is not immediately used, it is indispensable that this substance becomes not brittle or liable to detach itself from the glass.

Then, again, essence, benzine, or alcohol varnishes give out disagreeable odors when the coating is spread, and it becomes necessary to use the same dissolvent to remove the anti-halo coating, and the varnish at times is very adhesive. Some substances, such as gutta-percha and caoutchouc, can be removed dry, but they produce scales when detached suddenly, which may fog the sensitized coatings. The pomades that do not dry completely soil the interior of the plate-holders, therefore cause stains on the sensitized coatings, the devel-

opers refusing to penetrate the part of the gelatine soiled by the greasy stain.

Among the products that remain more or less firm when dry and still adhere to the glass, it is indispensable:

1. That the compound dries rapidly.

2. That it be easily detached from the glass when its suppression is desired, either after, or preferably before, development, to avoid troubling the baths with corpuscles that may penetrate the gelatine.

We have tried every proposed formula, and have rejected those which take longer than fifteen minutes to dry. We give in this article that which, in our opinion, is the best to be applied to all sensitized plates. (It is known that the thin films give negatives exempt from the halo due to reflection, which is also in accord with the reasoning of the question.)

The following is the formula:

Caramel	1 part.
Thick solution of gum arabic..........................	1 "
Burnt sienna earth	2 parts.
Methylic alcohol	2 "

Spread this very rapidly over the glass, not occupying more than five or six minutes at the most.

Delaware Water Gap *By T. L. Brown*

This paste is preserved damp and viscous, ready for use, by placing it in tin tubes such as are used for colors. This compound can also be poured over marble to make it into little tablets, which can be dissolved in warm water when used.

I take care, after spreading this paste in a very thin coating on the back of the plates, to cover it with a thin black paper known in France as "Serpentine Paper."

To remove the compound, it suffices to place in a tray a rag or piece of felt well soaked; the side of the plate covered with the compound is placed on the rag, and in less than a minute it can easily be removed with a cloth.

The only difficulty in the composition of this compound is the making of the caramel. Take about half a kilogram of powdered sugar, or less if one wishes, place it in a saucepan, either enameled

Engraved by
Gatchell & Manning,
Philadelphia

Photographed and Copyright, 1899, by Geo. E. Tingley

STUDY OF SHEEP

or tinned, and melt it slowly (without water), stirring with a glass or metal rod. The liquefied sugar first becomes light, then red, and finally brown; remove it from the fire, stirring it. This caramel is poured over marble. It must be brittle, soluble in water, and not hygroscopic. We are certain that the above formula will be adopted by every amateur who reads this ANNUAL, as it gives a compound drying rapidly, very adhesive, and easily removed.

JAMAICA AS A GOOD WINTER RESORT FOR AMATEUR PHOTOGRAPHERS

BY E. K. HOUGH

AMATEUR photographers are searching the world over for new and novel scenes on which to expend their artistic skill. There are few places where nature shows so much of picturesque beauty in wild luxuriance, combined with the comforts of civilization, as in the Island of Jamaica.

The first thing to attract the attention of a stranger is the wonderfully good system of roads, by which easy access to all parts of the island is made possible. To begin with, the island is about one hun-

By H. C. Close

dred and fifty miles long, and there is a good carriage or bicycle road all around it, mainly so near the coast that continual glimpses of the sea and shore are passing like a panorama of beauty, varied at every turn, until a ride or drive along the coast-line becomes a perpetual feast of nature's loveliness. Then the roads into the central parts are along the winding streams in valleys, or on the brows of hills overlooking wide rolling plains bounded by high cloud-capped hills, rising into mountain peaks, and spreading out in plane after plane of soft hazy distances to delight the eye of an artist, and make a pho-

tographer glad he brought his yellow screen, to catch and hold the delicate detail of the far-away distance.

Then the valleys in the mountains through which the roads run are often veritable natural hothouses, where, by heat and dampness combined, giant ferns are produced, and the whole road and mountain-sides are genuine ferneries on a magnificent scale, with every variety from the finest maidenhair to tree-ferns ten and twelve feet high. Some valleys are a perfect tangle of giant creeping vines, which cover the trees and hang down with long swaying tendrils, reaching for the earth, where they take root and grow again like Banyan trees, until the whole forest is like a vast network of living green.

Jamaica is called "The Land of Many Rivers." The central parts being high, the watersheds are frequently interspersed with swift-flowing streams and miniature waterfalls or cascades, very picturesque objects in the landscape, and the delight of tourists.

By E. B. Core.

All these scenes of tropical luxuriance are made accessible with ease and pleasure to the tourist on bicycle or by carriage, because in years past the English government took measures to make good roads, and they have not only made them well, but all the main roads, being under control of the general government, are kept up with unceasing care and labor.

A Road Inspector has charge of a section, with men and women under him constantly at work. No ruts or sink-holes are permitted to obtain. Just as soon as repairs are needed, they are made with as much care and promptitude as by the section hands on a well-kept railroad. Every little way by the roadside the traveler will observe small piles of broken stone, containing about an ordinary cart-load, the pieces being about the size of walnuts or hens' eggs. Often he will see groups of old men and women, colored of course, breaking these piles of stone, and will come to places in the road where they have been spread in repairs, sometimes to fill a small depression, and sometimes extending over many rods.

There are more miles of good carriage roads on the little Island of Jamaica than on the great Island of Cuba; yes, ten to one, and more than Cuba will probably have in the next twenty-five or even fifty years. Yes, more than that; there are more miles of good carriage roads in Jamaica than there are in the whole State of New

York, if the uniformly good quality all the year round is taken into consideration.

These advantages, with the added considerations of a country well governed, under good police control, and with a peaceable, law-abiding people, speaking English, go to make Jamaica an ideal resort for the amateur photographer, especially if he is a cyclist as well.

TRANSPARENCIES BY THE ANILINE COLORS

By P. C. Duchochois

THE process described in this article is not new, but is, however, little known, and consequently practiced by very few amateurs, although susceptible of producing fine results, useful for the decoration of ivory, nacre, marble, wood, and glass. The manner of making transparencies will only be described.

A glass plate is slightly grained with emery, or, better, with white hydrochloric acid (that is, a solution of sodium fluoride specially sold for frosting), in order to secure a perfect adherence of the picture, and coated with the following solution:

Le Page's soluble glue	1 dram.
White of egg	1 ounce.
Water	1 ounce.
Bichromate of ammonia	25 grains.
Ammonia, conc	30 minims.

Beat this to a thick froth, let settle for a few hours, and decant the clear liquid in a vial. It will keep for two or three weeks in the dark.

To coat the plate—quite clean, of course—wet it under the tap, drain it, and, while it is still wet, pour on the bichromated albumen compound, commencing from the top and allowing it to successively cover every part of the plate, when, after draining, it should be coated a second time in the opposite direction. Now, the excess of liquid having been drained in a vial, the coating should be dried immediately by heating the plate and fanning, to prevent the crystallization of the bichromate. When heating the plate, care should be taken not to overheat it. At 150° F. the albumen commences to coagulate and becomes insoluble. It is better not to exceed 90° or 95°.

The reader knows that the processes on the films of any bichromated compound, albumen, gelatine, gum arabic, etc., are based on the insolubility of the films in the parts acted on by light, which consequently form the photographic image. Hence, as said above, it is essential not to overheat the plate, and to keep it in the dark-room until wanted for use.

The plate is exposed under an intense negative in line. The exposure in the shade—exposing in the sun is objectionable—does not require more than four or five minutes on a clear day; fifteen to thirty minutes in cloudy weather. When the negative is very intense, which is always recommended for all the processes based on the action of light on bichromated films, good results are obtained by an exposure of, say, forty-five minutes, whatever be the state of the weather.

On its removal from the printing-frame, the image is developed by immersing the plate in cold water, which dissolves the albumen-gelatine compound in the parts not acted on by light; the others, being insolubilized, represent the picture. An immersion of about ten minutes suffices. The picture is faintly visible by its reliefs when seen at a certain angle. After the immersion, the plate is rinsed under the tap to insure complete development of the picture in all its details, the only defect arising from short exposures, whereby the delicate details—lines—are washed off.

It now remains to color the almost invisible image. The dyes employed are the aniline and the fast colors of alizarine, dissolved in alcohol almost to saturation. The solution should be flowed on the plate immediately after the development, that is, without drying. The plate should then be drained, and the alcohol allowed to completely evaporate, the plate being laid in a horizontal position meantime. This done, it is washed under the tap to clear the ground, and set aside to dry spontaneously.

If the ground is veiled—that is, if it retains a thin coating of coloring matter, which happens when the negative is not sufficiently intense, or when the plate has been over-exposed, the veil can be removed by brushing, under water, with a soft brush.

PROCESS WORK

SIMPLE METHOD OF PREPARING COLOR SCREENS

By Major-General J. Waterhouse, I.S.C.

THE following method of preparing color screens is only a suggestion, as I cannot speak of its merits from practical experience in working; but it seems to have certain advantages over screens made with dyed gelatin or collodion, which, so far as I have tried them, have always shown more or less *structure*. In this case there is absolutely no structure, and the method is exceedingly simple and well adapted for experimental purposes with suitable dyes. With a very few pairs of parallel glasses or even single glasses, a great many combinations of colors can be easily and quickly tried.

As a rule, the anilin dyes, though generally more or less soluble in alcohol, are not soluble in turpentine, benzol, or other similar solvents ordinarily used in making varnishes, but many of them are soluble in the essential oil of cloves, which is rather an unctuous and slow drying oil, so that a layer of it colored with dye and pressed between two glasses forms a very homogeneous and clear colored screen, the strength of which can be readily modified as desired.

On testing, I found the following dyes most suitable for the purpose. As a rule the colors are not much affected by the solvent; but in some cases they are, and these have been noted in italics.

Reds.

Cyanosin (*rich crimson*), Erythrosin, Eosin (blue shade)—the yellow shades are not very soluble—Phloxin, Rose Bengal, Pyrosin (*scarlet*), Saffrosin, Rhodamin (*fine violet*), Rubin (*violet*), Soudan (*rich crimson*), Safranin (*fine crimson*), are all soluble.

Benzo-purpurin, Carmoisin, Primrose, are slightly soluble.

Acid Maroon, Naphthalene Red, Persio, are insoluble.

Yellows.

Auramin, Azo-Yellow, Citronin, Azo-flavin, Tropæolin, Orange R, Picric acid (*deep orange*), Uranin, Chrysoidin, are all soluble.

Tartrazin, Naphthol Yellow, Phosphin, Chrysoin, Vesuvin, Atlas Scarlet, Brilliant Scarlet, Orange G, are insoluble or only slightly soluble.

Greens.

Malachite. Green, Brilliant Green, Anilin Green (*blue*), Ethyl Green, Victoria Green, Dragon Green, Bitter Almond Green, are all very soluble.

Methyl Green and Naphthol Green are only very slightly soluble.

Acid Green, Aldehyde Green, and Cerulein are insoluble.

Viridin Green, which contains picric acid, dissolves with a strong orange tint.

BLUES.

Victoria Blue, Azo-Blue (*violet tinge*), Methylene Blue (*greenish*), Nicholson's Blue (*indigo*), Night Blue, Nile Blue (*greenish*), Benzyl Blue (*violet*), Bayer's Blue 4B (*Prussian Blue*), are all very soluble.

Alizarin Blue is soluble with a red color.

Bleu de Lyon, New Fast Blue, Methyl Blue, Alkaline Blue (*greenish*), Water Blue, are very slightly soluble.

Poirrier's Blue and London Blue are insoluble.

VIOLETS.

Dahlia, Gentian Violet, Methyl Violet (6B), Ethyl Purple (*mauve*), Spiller's Purple, Acid Violet (*blue*), Alkaline Violet (*bluish*), are all fairly soluble.

Violet 4RN (Hofmann's) and Neutral Violet give crimson solutions.

New Violet gives a neutral tint.

Coupier's Blue and Indigo-Carmine are slightly soluble, Indulin less so, and Nigrosin quite insoluble.

The data given above will serve as a guide; but it may be noted that different makes of dyes sold under the same name may vary considerably in their behavior with solvents.

THE AFTER-ACTION OF LIGHT IN THE CHROMATE PROCESSES

BY J. GAEDICKE

(*Translated by Henry Dietrich*)

IN the carbon process, as well as all other chromate processes which are based on the action of light upon organic substances, making them insoluble when mixed with bichromates, the so-called after-action of light plays an important part, the reason of which has not yet been sufficiently cleared up. Abney observed, 1872, that a carbon print, finished to three-quarters of its correct printing time, and kept in the dark from twelve to fourteen hours before being developed, will on development show sufficient exposure. Eder gives for this apparent after-action of light the following explanation (" Handbook," iv., p. 382) :

" This appearance is based upon the fact that the older chromate gelatine becomes, the less soluble it is, particularly if it is kept in a warm and damp atmosphere, and that in consequence of this tendency, slightly exposed half-shadows, which, owing to short light-

GRAND PRIZE PICTURE
By J. Ed. Rosch
St. Louis

Awarded by Missouri-Illinois Photographic Convention, St. Louis, August 23-25. The bronze statue shown in the picture is the prize awarded.

ART HALF TONE
Engraved and Printed by
BARNES-CROSBY CO.,
Artists and Photo-Engravers,
Chicago and St. Louis, U. S. A.

action in printing become only slightly insoluble, will, after the chromated film is allowed to age a little, become sufficiently insoluble to resist the action of warm water in the washing of the film."

This explanation is undoubtedly correct, but it seems not to be sufficient to demonstrate the strong degree of after action, amounting to one-quarter of the entire light action. The self-decomposition of the chromate gelatine appears to us to be only a helping factor in this process, as proved by a closer investigation of the reduction products of the chromic acid.

The chemical process taking place on the exposure of chrome gelatine, should not be regarded as simply the formation of a brown chrome superoxide out of the bichromate, which exercises a strongly tanning action upon the gelatine, but, on the contrary, that intermediate products between chromic acid and chrome superoxide result. I have made several tests to explain this appearance.

The chrome oxide with the chromic acid forms a number of well-defined compounds, which are so much the more soluble, the more chromic acid they contain. Four distinct compounds of chrome oxide with chromic acid have been known for a long time, namely: The chrome-acid chrome oxide (also known as chrome superoxide,) and the double, triple, and quadruple chrome-acid chrome oxide. These compounds contain, in one equivalent of chrome oxide, one, two, three, and four equivalents of chromic acid, with more or less water. The first two are insoluble, the third dissolves with difficulty, and the fourth dissolves easily in water. But besides these there is still another compound which results, and which appears also to exist in the strongly exposed chromate gelatine. Eder's determinations of chrome oxide and chromic acid in the chromate gelatine lead to the same formula as the analysis of the compound mentioned, which contains, in three equivalents of chrome oxide two equivalents of chromic acid, and contains water besides.

The following is a description of the three compounds of chrome oxide and chromic acid most important for our purpose:

Chrome-Acid Chrome Oxide.—If a solution of 9.988 grams (one equivalent) of chrome alum with 1.944 grams (one equivalent) of single chromate of potassium and 3.36 grams (two equivalents) of bicarbonate of soda is mixed and boiled, a brown precipitate is obtained, which dries at 100° C., corresponding with the formula $Cr_3O_6+4N_2O$. By boiling with diluted soda lye, it decomposes to green chrome oxide and chromate soda. The chrome oxide was weighed as such, and in the filtrate the chromic acid was determined as chromate of lead.

This proceding in the analysis was also observed with the following compound:

Two-thirds Chromic Chrome Oxide.—If a solution of 9.988 grams of chrome alum (one equivalent) is mixed with 3.888 grams of single chromate of potassium (two equivalents) and 1.68 grams of bicarbonate of soda (one equivalent), and then boiled, a brown pre-

cipitate will form, but this does not consist of bichromate chrome oxide, as might be supposed according to theory. The reaction does not take place smoothly, and bichromate of potash remains in the solution. The brown body is decomposed in the heat by the diluted soda lye into green chrome oxide and dissolved chromate of soda. The analysis resulted in a composition of

$$3Cr_2O_3,2CrO_3 + 18N_2O = Cr_8O_{15} + 18N_2O.$$

If the reaction was not accomplished smoothly with these proportions, single chromate chrome oxide might also have resulted instead of the bichromate chrome oxide; but as neither of the two formed, the two-thirds chromate chrome oxide must be looked upon as the natural result.

Quadruple Chromate Chrome Oxide.—This is obtained if an aqueous solution of 9.988 grams of chrome alum (one equivalent) is poured into very diluted ammonia (8 c. c. ammonia with 20 c. c. of water), the excess of the ammonia is boiled, and the precipitate of hydrate of chrome oxide is then filtered and well washed. The hydrate of chrome oxide is carefully taken from the filter, when still moist, put into a tray, and is poured over with 4 grams of pure chromic acid (four equivalents) dissolved in a little water, in which it dissolves easily. The deep, dark brown solution is evaporated over the water-bath, and furnishes a gummy, brittle, dark brown substance, which dissolves without decomposition in diluted tartaric acid, and will not become cloudy by boiling. A substance of quite similar properties forms, together with a brown powder, if chromic acid is added to alcohol of 96 per cent. It is the first reduction product of the chromic acid.

All the three compounds mentioned pass into pure green chrome oxide by strong heating and loss of oxygen; but even at moderate heat some chromic acid is decomposed, and chrome oxide is formed in place of it. The analysis generally shows too high a chrome oxide value. If dry heat is applied to remove all the water (and it is advisable to dry the compounds at 100° C.), it is then easy to determine the chrome oxide and chromic acid, and to find out the quantity of water present from the difference.

To follow the printing process in the bichromate methods, it should be remembered that the bichromate contains one-half of its chromic acid so free, that, with some restriction of the intensity of action, it can be considered as monochromate with chromic acid. In explaining the process, the monochromate may, therefore, be neglected, and only the actions of the chromic acid be explained.

If now, from an excess of chromic acid, 2 molecules of chromic acid lose three molecules of oxygen in reduction, and form 1 molecule of chrome oxide, this will at once absorb 4 molecules of chromic acid, and will form quadruple chromate chrome oxide. This must, therefore, be the compound first to originate. The further the reduction proceeds, so much richer the compound will become in chrome

oxide, and as end product of the reduction the two-thirds chromate chrome oxide will appear, but not the single chromate chrome oxide, as has been so far generally accepted. Eder's analyses of chromate gelatine, after an exposure of from two to three weeks, agree with this theory. The proportion of chrome oxide to chromic acid found by him corresponds exactly to the formula

$$3Cr_2O_3,2CrO_3 = Cr_8O_{15}.$$

At one-quarter the time of exposure, the proportion of chrome oxide to chromic acid, expressed in equivalents, was as 3 : 2.5, showing more chromic acid, and was, therefore, apparently a mixture of two-thirds chromate chrome oxide and quadruple chromate chrome oxide.

The printing process which takes place in the chromate gelatine will, therefore, proceed in such a way that on the surface there will first form quadruple chromate chrome acid, which by further exposure passes into two-thirds chromate chrome oxide. The brown colored product will reduce the action of light upon the film underneath in such a way that only quadruple chromate chrome oxide, a soluble substance, will originate. The printed picture will, therefore, contain upon the surface insoluble two-thirds chromate chrome oxide, and with lower film soluble quadruple chromate chrome oxide. If we adhere to this fact, an influence upon the explanation of after-printing cannot be denied.

The quadruple chromate chrome oxide has very powerful tanning properties, of which we can convince ourselves by immersing a sheet of gelatine to one-half into the solution. The immersed gelatine assumes a brown color, which cannot be removed by washing, and becomes insoluble in boiling water. But the same also takes place if the solution mentioned is diluted with an excess of bichromate solution. If we consider now, that the printed film is not absolutely free from water, and that without doubt diffusion processes take place therein, it is clear, that in the printed-out film in the deposit between the lower picture film, which consists of quadruple chromate chrome oxide, and the next following film, which consists of undecomposed bichromate, by diffusion a connection will take place, in such a way that the bichromate penetrates into the upper, and quadruple chromate chrome oxide penetrates into the lower film. The lower film will also be tanned thereby, that is, the action-bearing deposit passes further into the depth of the picture film and intensifies the action of light. This theory is further supported by the fact, that the process of after-printing proceeds more quickly in a warm or moist atmosphere than in a dry, cool atmosphere, both being conditions which must accelerate the diffusion process. It is not impossible that, with an absolutely dry film in absolutely dry atmosphere, the after printing would not take place.

These diffusion processes, perhaps, also play a part with the apparently voluntary insolubility of the chromate gelatine, in such a

way, that the product of atmospheric action upon the exterior surface (which can be produced by a gas flame burning in the drying room), affects the film to a considerable depth by diffusion; because here it has also been observed that the progress toward insolubility of the film is much quicker in a moist and warm atmosphere than in a dry, cool place, as, for instance, a chloride of calcium can.

The results of this investigation may, therefore, be summed up in the following statement:

1. At strong action of the light, two-thirds chromate chrome oxide originates in the upper film of the picture.

2. That the after-action of printing, besides the voluntary progress toward insolubility of the chromate gelatine, is based upon a diffusion of the quadruple chromate chrome oxide into the unchanged chromate gelatine lying underneath.

THE NODAL POINTS OF PHOTOGRAPHIC LENSES

By Commandant V. Legros

IN our article of last year we stated the fact that a photogrammetric apparatus, such as the one which we defined the means of constructing, may be considered as an instrument perfectly appropriate to the determination of the geometrical invariability of photographic lenses. In answer to the flattering invitation of the Editor of the ANNUAL, we think we cannot do better this year than to return to this subject, and insist on the fact that an apparatus so constructed lends itself particularly to the determination of the position of the nodal points of the photographic lenses.

We remember that the apparatus in question may simply be the first photographic apparatus at hand, mounted on a divided circle, but characterized by the two essential peculiarities: that on the ground glass be traced a precision quadrilateral, and that the camera rest on a double platform, swung with hinges, and governed by a turnback screw, that, independently of the regular movements of the arrangements of the circle, allows placing one of the systems of the parallels of the quadrilateral perfectly vertical. It is not necessary that the lines of the quadrilateral be numerous or very close, but it is absolutely necessary that they be exactly placed at the dividing machine and very finely traced. The precision measure of this quadrilateral is the measure itself of the precision of all the operations carried out with the apparatus.

We also recollect that the focusing must be done by the method defined by Mr. Clarence E. Woodman under the name of "parallactic method." It consists in focusing by bringing from an exterior point with the greatest care the image sharply defined in coincidence with one of the intersecting points of the lines of the quadrilateral. Then

one must verify if, in displacing the eye and the lens to be focused with, the coincidence still exists, and, if to the contrary, modify the focus in so far as it remains invariable.

In relation to the nodal points, the photographers who desire to note the properties of the instruments they use, realize that the most elementary demonstration given by all the works for the purpose of explaining the course of luminous rays through photographic lenses is in general but a rough approximation. In reality, the sole optical centre through which this demonstration causes all the rays to pass must nearly always be reduced to two points situated on the axis of the lens, and more or less separated, and it is to these points that the name of " nodal points " is given. It is to the front nodal point that all the luminous rays emitted by the exterior objects converge, and from the back nodal point that these same rays diverge again to form the photographic image. It is from this point that the focal length must be exactly measured.

It is precisely the focal length taken from the back nodal point that gives the method which we presented last year. It suffices to measure by some means, for the same focus, the distance that separates the centre of the ground glass from the surface of the lens turned toward the glass, to obtain by difference the position of the back nodal point in relation to the material elements of the construction of the lens. Ordinarily this point falls in the interior of the lens in double lenses; but it can be thrown out; and even, very far, for telephoto lenses.

One can also very easily determine the position of the front nodal point, if, as it happens with the one we have, the apparatus employed allows the lens to be screwed if desired either in the interior or in the exterior of the camera. We would not be understood to claim that this way will give in every case equally correct images, but it always gives some image, and this is all that is necessary for our present object.

It is to be remarked that, with a photographic lens used outside, the two focal lengths found must be identical; but the position of the nodal points in relation to the exterior faces of the lenses may be very different from all quarters, if it does not relate to a lens exactly symmetrical. The two focal lengths would cease to be identical if the two faces of the lens were plunged in the centres of indexes of different refractions, as takes place in the immersion microscopic lenses, in eyeglasses, or even in a photographic apparatus operating under water, where, it is understood, the camera must be water-tight.

The consideration of the nodal points is of the greatest importance in all works of reproduction. The majority of works on photography give for enlargements and reductions, formulas of an extremely elaborate aspect for the inexperienced. In the galleries one finds operators who consider themselves very wise, imagining that they understand these formulas, and under this pretext look down on their fellow-workers who hold themselves to the rule of thumb.

Our excellent friend Anthony's ANNUAL reproduces every year for the benefit of its numberless readers over all the world, the translation of these formulas in numerical tables. It is well known, however, that the only operator really irreproachable in all this is the man of the rule of thumb. The formulas and the ciphers are, in fact, equally wrong unless the worker restrict himself to measuring the distance from the object, starting from the front nodal point, and the distance of the photographic plate from the back nodal point; and we do not know that the notion of the nodal points to the present day is generally understood in the galleries for reproduction.

Generally, the interval of the nodal points (or interstices of the knots) is quite weak, and for a natural size bust reproduction, for example, if a difference of a quarter of an inch is found, the matter is of little importance, more so as we have never believed that any one has ever exactly defined what is understood by a portrait in natural size. The same space would, however, become very disastrous if, for the reproduction of geographical charts in several hundred sheets, as in this case one would hand the different sheets to different operators, who would employ instruments with knot interstices sensibly unequal, without further guide than a blind faith in the formula.

We have been the first, we believe, to call attention, in our "Eléments de Photogrammetrie," to the fact that, in the rotating apparatus of the cylindergraph style, while it is from the back nodal point that the photographic image irradiates, it is the front nodal point that, for exact correction of the image, should find itself in the rotation axis. At the same time, we call attention to the fact that this antagonism does not exercise any influence whatever on the correction of photogrammetric operations, and our last year's article had for its object to establish that, for the determination of the focal length of the lens, the influence of this space, and even of a much greater space, though real, is entirely to be neglected in practice, provided one restricts oneself to effect the sightings in points at a sufficient distance from the apparatus. Concerning the pivoting apparatus, the constructors have since that period endeavored to escape the dilemma resulting from this property by admitting only lenses in which the two nodal points are confused in one.

This condition can be realized; but it is a serious difficulty imposed on the optician, who, moreover, has everything to resolve, and further diminishes the chance to obtain a lens of exceptional fineness. There is no special difficulty in determining by calculation the conditions of establishing a lens at the interval of the knots equal to zero; but by sequence of the defect of an absolute homogeneity of the first matter and of workmanship, and probably also by reason of circumstances that still escape the most minute calculation, it happens that the optician, once in possession of a lot of lenses made under these conditions, finds that the collections furnishing the fineness of the most exquisite image are not those that would appear to best

answer the provisions of the theory; and that the values of the spaces from which result the most advantageous effects are sensibly different from those determined by the calculation. The maker who only aims at the perfection of the results, and the lenses that best procure them, constructs them with the spaces that suit them best; therefore, the lenses of symmetrical type hardly ever present a complete symmetry, and do not have in their focal lengths the exact uniformity implied by the catalogues.

But any alteration of the shape, and moreover of the spaces of the lenses of a composite lens, immediately affects the value of the interstices of the knots, and this interstice appears in a type that should not be permitted. Consequently, the maker of pivoting apparatus, forced by the necessities of his system, must search, even at the cost of a certain inferiority in the fineness of the obtained images, for lenses in which the fusion of the two nodal points is effectively realized. The operator in a gallery for reproduction, to whom the highest possible degree of fineness of these images is not material, must, above all, find it in the lenses that he chooses. Only when he executes a work requiring a certain precision, must he be modest enough to hold himself to the empiric teachings; or, being well versed in the mysteries of photographic optics, be not afraid to take the bull by the horns and take into account the interstices of the knots. The traditional formula has, therefore, for him but the value of a first and rough approximation, which allows him to appreciate *a priori* if his apparatus have a sufficient length for the particular work he proposes to exact from it.

A GOOD HALF-TONE ENAMEL, AND HOW TO COAT A LARGE PLATE EVENLY

By H. Woodbury Shaylor, Jr.

A GOOD HALF-TONE ENAMEL.

A.—Eggs (albumen)	6	ounces.
Water	24	"
B.—Ammonium bichromate	270	grains.
Water	16	ounces.
C.—Le Page's glue	16	ounces.
D.—Ammonia	4	drams.

Take the albumen of sufficient eggs, say six or seven, to make six ounces, and put them in a large bowl, beating with an egg-beater to a stiff froth, then add eight ounces of water, and beat again thoroughly. Keep adding water until you have used the twenty-four ounces.

Powder in a mortar your ammonium bichromate, and dissolve in sixteen ounces of water, adding the water gradually.

Take sixteen ounces of Le Page's glue, mix with the albumen solution, and add slowly the bichromate solution. With the egg-beater beat vigorously for four or five miutes to insure perfect assimilation.

If you wish to use the solution immediately, add four drams of liquid ammonia; but, if convenient to let stand a few days, do not add the ammonia. It is necessary to filter the solution two or three times before using. This solution will keep two weeks or even longer, and will work nicely.

HOW TO COAT A LARGE PLATE EVENLY.

Select your metal of the required size, and polish it with a buffing-wheel, or, if a buffing-wheel is not at hand, use a piece of charcoal, polishing it with the grain of the charcoal, and then crosswise of the grain. You will find that this is next best to having a buffing-wheel in producing a highly polished surface. Rinse the plate under the tap,with a tuft of cotton to remove all charcoal dust, place on the whirler, and whirl a few times to remove the surplus water. Flow the enamel over the plate, and whirl rapidly to drive off all the water possible. Flow the plate a couple of times more, and whirl again. This time be sure to whirl the plate so that it revolves in two directions, i. e., turn it for a few minutes in one direction, and then reverse the motion, revolving it in the opposite direction, continuing this until the plate is perfectly dry. This method I have found to be of great advantage on large plates, as it gives a more even coating all over the plate. I have had considerable trouble with large plates from the corners not coating evenly, the two opposite corners having a thicker coating than the two corresponding opposite corners, causing lots of trouble in the printing. The method of revolving the plate in different directions has overcome this difficulty, and insures evenly coated plates.

RETOUCHING PHOTOGRAPHS FOR HALF-TONE REPRODUCTION

By H. D. Farquhar

THE incessant advance of photo-engraving has naturally piled obstacles seemingly mountains high before energetic craftsmen following the art of making engravings by the use of that most fascinating process, photography. During the first decade, engravers and their patrons were satisfied with results in half-tone cuts made from photographs as received from the hands of the photographer. Ambitious desires to do better

Engraved by *By Strauss*
Teachinor-Bartberger Eng. Co.,
Kansas City, Mo.

A PORTRAIT STUDY
FROM COMPLIMENTARY EXHIBIT, P. A. OF A., 1899

or more attractive work have, however, caused a radical change, and to-day a half-tone is seldom handed to the engraver before it has passed through the hands of an artist, whose trained eye readily discovers special features that are lacking, which must be supplied in order to obtain artistic and pleasing effects. To accomplish this, high lights are added and shadows strengthened. If the subject in hand should be a machine, the chances are that the entire subject would have to be gone over, drawing in detail, and showing special features that were perhaps impossible to secure in the photograph.

The foregoing may seem to the layman very smooth sailing; but the mountain above mentioned will soon appear on the horizon, and before the top is reached many experiments must be gone through. A surface must first be prepared on the photograph which will permit the drawing to be washed on smoothly. In order to accomplish this, the photograph must be treated with some preparation which will give the proper ground or foundation, and each kind of paper must usually be handled or prepared in a different manner, depending on the different brands.

Bromide paper is seldom encountered in this class of work, and would cause little trouble to retouch, as it will usually take colors without difficulty. Should Conte crayons be used, no trouble will arise. By rubbing with powdered pumice-stone, a fine grain will be produced suitable for crayon work.

For water colors, it is advisable to go over the print with absorbent cotton dipped in a diluted solution of ammonia to remove any grease that may be present.

Platinum paper is also easily worked, and can be treated the same as bromide.

Carbon prints will require treatment with pumice powder, or by washing with absorbent cotton dipped in water. This will cause the gelatine surface to soften somewhat, and must not be used before thoroughly becoming dry.

Aristo papers, being prepared with collodion emulsion, are perhaps the most difficult of all papers to handle, owing to the peculiarity of the coating, which has a very repellent action on water colors, as if coated with some greasy substance, causing the colors to draw together, in place of spreading smoothly and remaining so.

In order to combat such obstinate conditions, many theories have been advanced, the following of which will give an idea of the requirements:

If a very small amount of retouching is desired with pen and India ink, an application of alcohol will suffice, using cotton to spread and wipe off. Ox-gall can be used in a similar manner to good advantage, and may under many conditions do better service than alcohol. The application of saliva will make an excellent substitute for either alcohol or ox-gall, should you be situated where the latter are not available.

Where the entire surface is to be gone over with washes of

Chinese white and India ink, the following preparation is commendable:

Ox-gall	1 dram.
Alcohol	4 ounces.
Carbolic acid	6 or 7 drops.
Water	6 ounces.

When thoroughly dry, the operation of retouching may be carried on.

Another method which will give satisfactory results, is to make a size by dissolving gelatine in as much water as it will take up by soaking for half an hour; or by boiling some clean parchment cuttings until they form a clear solution, strain through muslin, and apply in either case with a flat camel's hair brush.

The addition of a little ox-gall to drawing ink will prevent crawling on some surfaces, in which case subsequent preparation of the photographs may be dispensed with.

A splendid idea is to use a suitable vehicle in which to mix or dilute the colors used, and at the same time make them flow smoother and become fixed when dry. A preparation of this kind can be made as follows:

Take one-half ounce of dry egg albumen, and dissolve in two ounces of cold water, which will take about twenty-four hours. When thoroughly dissolved, add one dram of glycerine and eight drops of ammonia, mix thoroughly, and filter through cotton. Should this prove too thick, it may be diluted to any consistency with water.

The above hints are gathered from practical every-day work, and will, perhaps, be found of assistance in preparing photographic prints of all kinds for the process worker.

Photographic Tables and Formulas

DRY PLATE DEVELOPERS.

PYROGALLOL.

CRAMER PLATES.

No. 1.—*Alkaline Solution.*

Carbonate of sodium crystals (sal soda)	5 ounces.
Sulphite of sodium, crystals	10 "
Water	60 "

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish-black tone.

The alkaline solution must be kept in well-stoppered bottles.

If the negatives show yellow stain, make a fresh solution, or try another lot of sulphite of sodium.

To prepare the alkaline solution with the hydrometer, mix equal parts of the following solutions:

Carbonate of sodium solution	Hydrometer 40°
Sulphite of sodium solution	" 80°

No. 2.—*Pyro Solution.*

Dissolve 1 drachm of sulphite of sodium crystals in 6 ounces of distilled or pure ice-water, add acetic acid until the solution turns blue litmus paper red, and finally add 1 ounce of pyrogallic acid.

Mix in the following proportions:

Pyro solution	1 drachm.
Alkaline solution	1 ounce.
Tepid water (for winter use)	2 ounces.
Or cold water (for summer use)	3 to 5 "

If the high lights are flat, use more pyro solution.

If they are too intense, use less pyro solution.

If too little pyro is used, the alkali will be in excess, and cause fog.

CARBUTT'S.

No. 1.—*Pyro Stock Solution.*

Oxalic acid	15 grains, or	1 gram.
Bromide of potassium	30 " "	2 grams.
Distilled or ice-water	10 ounces, "	300 c. c.

Then add Schering's pyro, 1 ounce, or 30 grams, and water to make 16 fluid ounces, or 480 c. c.

No. 2.—*Soda Stock Solution.*

Sodium sulphite, crystals..	4 ounces,	or	120	grams.
Soda carb., crystals (or dry gran. 1 ounce)	2 "	"	60	"
Potash carbonate	1 ounce.	"	30	"
Water	10 ounces,	"	300	c. c.

Dissolve and add water to make measure 16 fluid ounces, or 480 c. c.

No. 3.—*Bromide Solution.*

Bromide of sodium or potassium....	½ ounce,	or	14	grams.
Water	5 ounces,	"	150	c. c.

For Developer.

Dilute 2 ounces of Stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 ounces of water in summer. To 3 ounces of dilute No. 2, add 1½ to 2½ drams, or 6 to 10 c. c., of No. 1. The more pyro, the denser the negative, and *vice versa.* No yellowing or fogging need be apprehended if the directions are followed. Development should be continued until the image seems almost buried, then wash and place in fixing bath.

Instantaneous Exposures.

For instantaneous exposures, take for a 5 x 8 or 6½ x 8½ plate 3 ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drams of No. 1 into the graduate, and 3 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out by this time, add to developer in pan three times its bulk of water, and let plate lie in it covered for half an hour or more if necessary, until full development is attained; then wash, and proceed with fixing.

HAMMER.

The following two pyrogallic acid formulas are recommended if strong, vigorous negatives are wanted. The quantity of sulphite of soda in the developer must be regulated to produce the color desired. If a developer, made according to either formula, produces negatives too cold and gray in tone, reduce the amount of sulphite until the quantity is found that produces the best color or tone. In many cases it may be reduced one-half and produce better results; in some cases it may even have to be increased. This is regulated entirely by local conditions, such as quality of the water, condition of the sulphite soda, etc.:

PYROGALLIC ACID DEVELOPER WITH CARBONATE OF SODA.

No. 1.

Sulphite of soda, crystals	5 ounces,	or	150 grams.
Carbonate of soda, crystals	2½ "	"	75 "
Pure water	30 "	"	900 c. c.

No. 2.

Oxalic acid	15 grains,	or	1 gram.
Pyrogallic acid	1 ounce,	"	30 grams.
Pure water	24 ounces,	"	720 c. c.

To develop, take:

Solution No. 1	1 ounce,	or	30 c. c.
Solution No. 2	½ "	"	15 c. c.
Pure water	3 ounces,	"	90 c. c.

More water may be used in warm weather, and less in cool weather.

See that the developing solutions are not too cold in cold weather, nor too warm in warm weather. This applies to all developers.

If Solution No. 1 is made by hydrometer test, use equal parts of the following:

Sulphite of soda	Hydrometer 80°
Carbonate of soda	" 40°

One ounce of this mixture will be equivalent to one ounce of Solution No. 1.

PYROGALLIC ACID DEVELOPER WITH CARBONATE OF POTASSIUM.

No. 1.

Sulphite of soda, crystals	8 ounces,	or	240 grams.
Carbonate of potassium, dry	1 ounce,	"	30 "
Pure water	32 ounces,	"	960 c. c.

No. 2.

Oxalic acid	15 grains,	or	1 gram.
Pyrogallic acid	1 ounce,	"	30 grams.
Pure water	24 ounces,	"	720 c. c.

To develop, take:

Solution No. 1	1 ounce,	or	30 c. c.
Solution No. 2	½ "	"	15 "
Pure water	3 ounces,	"	90 "

When the plate is fully developed, if the high lights are too thin, use less water in the developer; if too dense, use more water.

WUESTNER.

No. 1.—*Pyro Stock Solution.*

Sulphite of soda, crystals	16 ounces.
Pyrogallic acid	2 "
Sulphuric acid, C. P.	10 drops.
Water	84 ounces.

No. 2.—*Soda Stock Solution.*

Sal soda, crystals	8 ounces.
Water	84 "

Developer.

Take 2 ounces of No. 1 and 2 ounces of No. 2, and add 8 ounces of water.

This developer may be used repeatedly as long as it remains clear, but will work slower and with more intensity when old. Therefore, the fresh developer is best for short exposures, and the old is better if the plate has been full timed. In using the sal soda developer, it is very important to carry the development far enough, until the lights have sufficient intensity when examining the plate by transmitted light.

Over-exposure is corrected by adding to each ounce of developer from 2 to 4 drops of solution of bromide of ammonium, 1 ounce to 10 ounces of water, or by putting the plate into a weak solution of bromide of ammonium, 1 to 50 water, before the development has proceeded too far, and then returning it to the developer to gain sufficient intensity.

If under-exposure is noticed, take the plate out of developer, and without draining put into soda solution. Sufficient developer will remain in the film to develop the shadows, the lights being prevented from gaining too much density in this way.

EASTMAN. (FOR FILMS.)

No. 1.

Pyrogallic acid	½ ounce.
Nitrous or sulphurous acid	20 minims.
Water	32 ounces.

No. 2.

Sulphite of soda, crystals	6 ounces.
Carbonate of soda, crystals	4 "
Water	32 "

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	2 ounces.

Eastman. (For Plates.)

No. 1.

Sulphite of soda, crystals	6 ounces.
Pyrogallic acid	1 ounce.
Water	32 ounces.

No. 2.

Carbonate of soda, crystals	4 ounces.
Water	32 "

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	3 to 4 ounces.

In warm weather use more water, in cold less.

Seed.

No. 1.

Sulphite of soda, crystals	4 ounces.
Pyrogallic acid	1 ounce.
Sulphuric acid (in winter use acetic acid)	10 drops.
Distilled or good well-water	16 ounces.

No. 2.

Sal soda, crystals	4 ounces.
Water	16 "

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	8 ounces.

In above developer, for double-coated plates use 18 ounces of water.

BY HYDROMETER TEST.

No. 1.

Clear sulphite of soda solution, hydrometer 60°	18 ounces.
Pyrogallic acid	1 ounce.
Sulphuric acid (in winter use acetic acid)	10 drops.

No. 2.

Sal soda solution	Hydrometer 40°

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	8 ounces.

In above developer, for double-coated plates use 18 ounces of water.

More water gives flatness, and less water contrast. Use less water in cold weather.

A B C PYRO DEVELOPER

A

Sulphite of soda, crystals .... ½ ounce.
Pure water .... 10 ounces.

Add enough pure acetic acid to this to turn blue litmus paper slightly red, then add:

Pyro .... 1 ounce.

B

Sulphite of soda, crystals .... 4 ounces.
Water .... 16 "

C

Sal soda, crystals .... 4 ounces.
Water .... 16 "

To develop, take:

A .... ½ ounce.
B .... 1 "
C .... 1 "
Water .... 8 ounces.

In above developer, for double-coated plates use 18 ounces of water.

Less of B will give a warmer tone to negative. If the negatives are too yellow use more of B. If it is found during the summer months, and in the South, that acetic acid softens the film too much, substitute sulphuric acid.

BY HYDROMETER TEST.

A

Sulphite of soda, crystals .... ½ ounce.
Water .... 10 ounces.

Add enough pure acetic acid to this to turn blue litmus paper slightly red, then add:

Pyro .... 1 ounce.

B

Sulphite of soda solution .... Hydrometer 60°

C

Sal soda solution .... Hydrometer 40°

Engraved by
Electro Light Eng. Co.,
New York

OCTOBER

By F. L. Fieger

To develop, take:

A	½ ounce.
B	1 "
C	1 "
Water	8 ounces.

In above developer, for double-coated plates use 18 ounces of water.

SEED.—(FOR NON-HALATION PLATE.)

No. 1.

Sulphite of soda, crystals	4 ounces.
Pyrogallic acid	1 "
Sulphuric acid	10 drops.
Distilled or good well water	16 ounces.

No. 2.

Sal soda	4 ounces.
Water	16 "

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	8 ounces.

In above developer, for double-coated plates use 18 ounces of water.

NEW YORK.

No. 1.—*Pyro Stock Solution.*

Distilled or ice water	10 ounces,	or 300 c. c.
Sulphite of soda	4 "	" 120 grams.

Dissolve, then add:

Pyrogallic acid	1 ounce	" 30 c. c.
Water to make up to	16 fluid ounces,	" 480 "

No. 2.—*Soda stock Solution.*

Distilled or ice water	10 ounces,	or 300 c. c.
Sol soda	4 "	" 120 grams.

Dissolve, then add:

Water to make up to	16 fluid ounces,	" 480 c. c.

No. 3.—*Bromide Solution.*

Bromide of potassium	½ ounce,	or 14 grams.
Water	5 ounces,	" 150 c. c.

To develop, take:

No. 1, Pyro stock solution	1 ounce, or	30 c. c.
No. 2, Soda stock solution	1 " "	30 "
Water	6 ounces, "	180 "

BY HYDROMETER TEST.

No. 1.

Make stock solution of sulphite of soda to test 60° with hydrometer; allow to settle perfectly clear; then take:

Sulphite of soda solution	16 ounces.
Pyro	1 ounce.
Sulphuric acid	10 drops.
Or oxalic acid	10 grains.

No. 2.

Sal soda solution	Hydrometer 40°

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	8 ounces.

J. Ed. Rösch's Formula for E. A. Extra Resublimed Pyro.

Prepare the alkaline solution with the hydrometer, mixing equal parts of the following solution:

Carbonate of sodium solution	Hydrometer 30°
Sulphite of sodium solution	" 70°

Pyro Solution.

Dissolve 1 drachm of sulphite of sodium crystals in 6 ounces of distilled or pure ice water, add acetic acid until the solution turns blue litmus paper red, and finally add 1 ounce of pyrogallic acid.

Mix in the following proportions:

Pyro solution	1 drachm.
Alkaline solution	1 ounce.
Tepid water (for winter use)	2 ounces.
Or cold water (for summer use)	3 to 5 "

E. H. Newell's Formula for E. A. Extra Resublimed Pyro.

No. 1.—*Soda Stock Solution.*

Carbonate of soda	Hydrometer 40°
Sulphite of soda	" 60°

Add together.

No. 2.—*Pyro Stock Solution.*

Pyro	1 ounce.
Oxalic acid	10 grains.
Water	6 ounces.

To develop, take:

Soda solution	1 ounce.
Pyro solution	1 dram.
Water	2 ounces.

J. S. Schneider's Formula for E. A. Extra Resublimated Pyro.

No. 1.

For Stock Solution take equal quantities of:

Sulphite of soda	Hydrometer 65°
Carbonate of soda	" 45°

No. 2.

Pyro	1 ounce.
Water	6 ounces.

Three or four drops of sulphuric acid, or just enough to turn blue litmus paper red.

To develop, take:

No. 1	1 ounce.
No. 2	1 dram.
Water	3 ounces.

PYRO-METOL.

Hammer's.

No. 1.

Sulphite of soda, crystals	2½	ounces, or	75 grams.
Metol	1	ounce, "	30 "
Pure water	57	ounces, "	1710 c. c.

No. 2.

Sulphite of soda, crystals	2½	ounces, or	75 grams.
Pyrogallic acid	¼	ounce, "	8 grams.
Pure water	57	ounces, "	1710 c. c.

No. 3.

Carbonate of potassium	2½	ounces, or	75 grams.
Pure water	57	" "	1710 c. c.

To develop, take:

Solution No. 1	1 ounce,	or	30 c. c.
Solution No. 2	1 "	"	30 "
Solution No. 3	1 "	"	30 "
Pure water	3 ounces,	"	90 "

This developer may be used repeatedly by adding a little fresh developer as required.

Keep the used developer in separate bottle.

It combines the desirable qualities of metol and pyro, and gives an ideal negative.

WUESTNER'S.

No. 2.

Oxalic acid	¼	ounce.
Pyrogallic acid	1	"
Metol (Hauff's)	¼	"
Bromide of potassium	16	grains.
Water	16	ounces.

No. 2.

Sulphite of soda, crystals	8	ounces.
Carbonate of soda	4	"
Water	64	"

To develop, take:

No. 1	1	ounce.
No. 2	5	ounces.
Water	2 to 4	"

METACARBOL.

Metacarbol	25	grains.
Sulphite of soda, crystals	100	"
Sodium hydrate (caustic soda)	50	"
Water	10	ounces.

Dissolve the metacarbol in the water, add the sulphite of soda, and, when this is dissolved, add the sodium hydrate, and filter. With this developer the time of exposure is considerably reduced.

Another formula is:

Metacarbol	½	ounce.
Caustic soda	1	"
Sulphite of soda	2	ounces.
Water	50	"

First dissolve the metacarbol and caustic soda in a little of the water (hot), and then add the sulphite of soda and the rest of the water.

For use, take 1 ounce of this solution and 2½ ounces of water. Use this repeatedly, by adding a little fresh solution from time to time.

Another formula, recommended by John Strathmann, is:

A.—Metacarbol (dissolved in 3 1-3 ounces water)	25	grains..
Sulphite of soda, hydrometer 15°	3 1-3	ounces.
B.—Sodium hydrate	Hydrometer 20°	

For use take:

A	2	ounces.
B	1	ounce.
Water	3	ounces.

For under-timed plates use more of B. For over-timed plates use less of B, or use old developer.

HYDROCHINONE.

Carbutt.

A.

Sulphite of soda, crystals	4 ounces, or	120	grams.
Sulphuric acid	1 dram, "	4	"
Hydrochinone	360 grains, "	23½	"
Bromide of potassium	30 " "	2	"
Warm distilled water	20 ounces, "	600	c. c.
Water to make up to	32 " "	960	"

B

Carbonate of potash	2 ounces, or	60	grams.
Carbonate of soda, crystals	2 " "	60	"
Water to make	32 " "	960	c. c.

C.—*Accelerator.*

Caustic soda	1 ounce, or	30	grams.
Water	10 ounces, "	300	c. c.

For under-exposure, add a few drops of above to developer.

D.—*Restrainer.*

Bromide of potassium	½ ounce, or	14	grams.
Water	5 ounces, "	150	c. c.

To develop.

For instantaneous Exposures, take: A, 1 ounce, or 30 c. c.; B, 1 ounce, or 30 c. c.; Water, 4 ounces, or 120 c. c.

For Portraits: A, 1 ounce, or 30 c. c.; B, 1 ounce, or 30 c. c.; Water, 5 ounces, or 150 c. c.

For Landscapes (Sen 20–27): A, 1 ounce, or 30 c. c.; B, ½ ounce, or 15 c. c.; Water, 3 ounces, or 90 c. c.

For Landscapes, Full Exposure (Sen. 16–20): A, 1 ounce, or 30 c. c.; B, ¾ ounce, or 25 c. c.; Water, 4 ounces, or 120 c. c.

For Lantern Slide: A, 1 ounce, or 30 c. c.; B, ¾ ounce, or 25 c. c.; Water, 4 ounces, or 120 c. c.

For Lantern Slides and Full Exposures: A, 1 ounce, or 30 c. c.; B, ¾ ounce, or 25 c. c.; Water, 4 ounces, or 120 c. c.; and 2 to 6 drops Restrained D to each ounce of developer.

Note.—More of A will increase density. More of B will increase detail and softness. Temperature of developer should not vary much below 65° nor above 75°. The after-treatment is much the same as with any other developer.

For Lantern Plates, Process Plates, and Large Transparencies.

No. 1.—*Hydrochinone Solution.*

Sulphite of soda, crystals	1	ounce.
Sulphurous acid	½	"
Water (distilled or boiled), warm	10	ounces

Mix with 2 ounces of cold water and add slowly to the sulphite solution, then add:

Hydrochinone	100 grains.
Bromide of potassium	30 "
Water to make the whole measure	15 ounces.

No. 2.—*Alkali Solution.*

Carbonate of soda, crystals	1 ounce.
Carbonate of potash	½ "
Water	3 ounces.
Water to make the whole measure	5 "

To form a developer, mix one part of No. 2 with three parts of No. 1.

SEED.

For Transparency Plates.

A.

Hydrochinone	120 grains.
Sodium sulphite, crystals	1 ounce.
Water	16 ounces.

B.

Caustic soda	60 grains.
Potassium bromide	60 "
Water	16 ounces.

C.

Ammonium carbonate	120 grains.
Ammonium bromide	120 "
Water	16 ounces.

Ribbon.	Distance.	Developer.	Color.
¾ inch	1 foot	A 1 oz., B 1 oz	Green.
1 "	1 "	A 1 oz., B 1 oz., C 2 dr	Brown.
1 "	1 "	A 1 oz., B 1 oz., C 3 dr	Purple.
2 inches	1 "	A 1 oz., B 1 oz., C 3 dr	Red.

BROMO-HYDROCHINONE DEVELOPER.

For producing Great Contrast and Intensity, also for developing Over-Exposed Plates.

No. 1.

Sulphite of soda, crystals	3 ounces.
Hydrochinone	½ ounce.
Bromide of potassium	¼ "
Distilled or ice water	25 ounces.

No. 2.

Carbonate of soda, crystals	6	ounces.
Water	25	"

Mix equal parts of Nos. 1 and 2 for use.

This developer is excellent for copying pen drawings and engravings, and for all purposes where great density of the lights and clear glass in the shadows are required.

BYK'S.

Hydrochinone	5	grams
Potassium carbonate	75	"
Sodium carbonate	40	"
Water to make	1000	"

Mix in reverse order. Use full strength.

DR. JUST'S.

No. 1.

Hydrochinone	10	parts.
Sulphite of soda	60	"
Distilled water	240	"

No. 2.

Carbonate of potassium	120	parts.
Acetic acid	15	"
Distilled water	480	"

To develop, mix the solution in equal parts for use. The best results are obtained by commencing development with an old or once-used developer, and, when development is half completed, applying fresh.

MIETHE.

No. 1.

Sulphite of soda	35	grams.
Yellow prussiate of potash	30	"
Hydrochinone	7	"
Water	550	c. c.

No. 2.

Caustic potash	30	grams.
Water	550	c. c.

To develop, use three parts of No. 1, and two to three parts of No. 2, according to exposure and desired density.

Edwards.

Carbonate of soda, granulated	100 grains.
Sulphite of soda, crystals	480 "
Hydrochinone	100 "
Water	14 ounces.

Use full strength.

Dr. Piffard's.

Sodium sulphite	480 grains.
Sodium carbonate	960 "
Hydrochinone	96 "
Water	16 ounces.

Mix and filter. This developer may be used repeatedly.

EIKONOGEN.

No. 1.

Sodium sulphite, crystals	2 ounces.
Eikonogen, finely powdered	1 ounce.
Water	40 ounces.

No. 2.

Potassium carbonate	1 ounce.
Water	10 ounces.

To develop, take 3 ounces of No. 1 and 1 ounce of No. 2. As a restrainer, use a few drops of a 10 per cent. solution of potassium bromide.

Eastman.

No. 1.

Sulphite of soda, crystals	3 ounces.
Eikonogen	1 ounce.
Water	60 ounces.

No. 2.

Carbonate of potash	3 ounces.
Water	30 "

To develop, take:

No. 1	2 ounces.
No. 2	1 ounce.
Water	2 ounces.

If you desire to have the developed negative of a warm tone, add 100 grams pyrogallic acid to No. 1 stock solution.

Engraved by
Williamson-Haffner Eng. Co.,
Denver, Colo.

By S. L. Stein

STUDIO WORK

Wuestner's for Portraits and Landscapes.

No. 1.

Sulphite of soda, crystals	3½	ounces, or	115	grams.
Oxalic acid	1	dram, "	4	"
Eikonogen	2½	ounces, "	75	"
Yellow prussiate of potash	½	ounce, "	15	"
Distilled water	80	ounces, "	2400	c. c.

Dissolve the eikonogen in hot water.

No. 2.

Carbonate of potash	2	ounces, or	60	grams.
Distilled water	20	" "	600	c. c.

Developer:

Take 4 ounces of No. 1 and ½ ounce of No. 2.

For aristo paper printing, to obtain thin negatives, dilute the developer more. For more intensity, add 10 grams of hydrochinone to No. 1.

New York.

No. 1.

Distilled or ice water	60 ounces.
Eikonogen	1 ounce.
Sulphite of soda, crystals	3 ounces.
Sulphurous acid	½ ounce.

Dissolve the eikonogen in 30 ounces of the water, warmed. Dissolve the sulphite in 20 ounces, and dilute the acid in 10 ounces. Pour the sulphite solution into the eikonogen, then add the acid to the whole. Never pour the eikonogen into the sulphite solution.

No. 2.

Carbonate of soda, granular	4 ounces.
Water	40 "

To develop, take:

No. 1	4 ounces.
No 2	4 "
Water	5 "

Add 10 drops of a 10 per cent. solution of bromide of ammonium. In hot weather increase the water to 10 ounces.

This developer can be used repeatedly by occasionally adding more of solutions No. 1 and No. 2.

To obtain thin negatives, full of detail, such as are required for printing on Aristo paper, use the developer more diluted.

After development, wash thoroughly under tap, and immerse in fixing bath.

EIKONOGEN-HYDROCHINONE.

CARBUTT'S.

A.

Sulphite of soda, crystals	4 ounces,	or 120	grams.
Eikonogen	330 grains,	" 22	"
Hydrochinone	160 "	" 10½	"
Distilled water	20 ounces,	" 600	c. c.
Water to make up to	32 "	" 960	"

B

Carbonate of potash	2 ounces,	or 60	grams.
Carbonate of soda, crystals	2 "	" 60	"
Distilled water	20 "	" 600	c. c.
Water to make up to	32 "	" 960	"

To develop, see Carbutt's Hydrochinone Developer.

SEED.

No. 1.

Sodium sulphite, crystals	4 ounces.
Eikonogen	240 grains.
Hydrochinone	60 "
Distilled or pure well water	32 ounces.

No. 2.

Carbonate of potash	4 ounces.
Water	32 "

To develop, take:

No. 1	2 ounces.
No. 2	1 ounce.
Water	1 "

In above developer, for double-coated plates use 5 ounces of water.

More water gives less contrast and density.

BY HYDROMETER TEST.

No. 1.

Sodium sulphite solution, hydrometer 30°	34 ounces.
Eikonogen	240 grains.
Hydrochinone	60 "

No. 2.

Carbonate of potash solution	Hydrometer 50°

To develop, take:

No. 1	2 ounces.
No. 2	1 ounce.
Water	1 "

Root's Developer.

No. 1.

Sodium sulphite, crystals	2½ ounces.
Eikonogen	1 ounce.
Hydrochinone	⅛ "
Water	64 ounces.

No. 2.

Potassium carbonate, dry	2½ ounces.
Water	64 "

To develop, take two parts of No. 1 and one part of No. 2, and old developer to give best results.

FERROUS OXALATE.

Neutral oxalate of potash, saturated solution. Protosulphate of iron, saturated solution. Sulphuric acid, 10 drops.

To develop.

Oxalate solution	10 ounces.
Iron solution	2 "
Old (used) developer	2 "

FOR TRANSPARENCIES AND OPALS.

Carbutt's.

A.

Oxalate of potash	8 ounces.
Citric acid	60 grains.
Citrate of ammonia solution	2 ounces.
Water	30 "

B.

Sulphate of iron	4 ounces.
Sulphuric acid	16 drops.
Water	32 ounces.

C.—*Citrate of Ammonia Solution.*

Dissolve 1 ounce of citric acid in 5 ounces of distilled water; add liquor ammonia until a slip of litmus paper just loses the red color; then add water to make the whole 8 ounces.

Developer.

Add 1 ounce of B to 2 ounces of A and ½ ounce of water, and 3 to 6 drops of 10 per cent. solution of bromide of potassium.

To develop, first rinse developing dish with water, lay film or plate down, and flow with sufficient developer to well cover. Careful attention must be given to its action, and, when detail is just showing in the face, or half-tone lights in a view, pour off the developer, and well wash the film before fixing.

METOL.

Seed.

No. 1.

Metol	100 grains.
Sodium sulphite, crystals	1 ounce.
Water	8 ounces.

No. 2.

Potassium carbonate	1 ounce.
Water	10 ounces.

To develop, take:

No. 1	1 ounce.
No. 2	1 "
Water	6 ounces.

METOL AND HYDROCHINONE.

Hammer.

No. 1.

Metol	1 ounce,	or	30 grams.
Hydrochinone	1/8 "	"	4 "
Sulphite of soda, crystals	6 ounces,	"	180 "
Pure hot water	80 "	"	2400 c. c.

No. 2.

Carbonate of soda, crystals	5 ounces,	or	150 grams.
Pure water	80 "	"	2400 c. c.

To develop, take:

Solution No. 1	1 ounce,	or	30 c. c.
Solution No. 2	1 "	"	30 "
Pure water	2 ounces,	"	60 "

Formula for a Small Quantity of the above Developer.

No. 1.

Sulphite of soda, crystals	150 grains,	or	10 grams.
Eikonogen	60 "	"	4 "
Hydrochinone	8 "	"	1/2 gram.
Pure water	8 ounces,	"	240 c. c.

No. 2.

Carbonate of potash, dry	150 grains,	or	10 grams.
Pure water	8 ounces,	"	240 c. c.

To develop, take:

Solution No. 1	2 ounces,	or	60 c. c.
Solution No. 2	1 ounce,	"	30 "

Can be used repeatedly until exhausted.

New York.

Sulphite of soda solution, hydrometer 25°	12 ounces.
Carbonate of soda solution, hydrometer 15°	12 "
Metol	50 grains.
Hydrochinone	60 "

To develop, take 1 ounce of solution to 2 ounces of water.

For instantaneous or undertimed exposures, use equal quantities of the solution and water.

Cramer.

Thoroughly dissolve:

Metol	¼ ounce.
Hydrochinone	¼ "
In water	80 ounces.

Then add:

Sulphite of soda, crystals	4 ounces.
Carbonate of soda, crystals	2½ "

To prepare this with hydrometer, mix:

Sulphite of soda solution, hydrometer 60°	20 ounces.
Carbonate of soda solution, hydrometer 30°	20 "

Dissolve the following:

Metol	¼ ounce.
Hydrochinone	¼ "
In water	40 ounces.

For summer use, dilute the developer with an equal quantity of water, also for large plates, so that the development does not proceed too rapidly and can be properly controlled.

If negatives of less contrast are desired, use less hydrochinone and more metol.

Seed.

For Black-Tone Transparency and Lantern Plates.

No. 1.

Metol	30 grains.
Hydrochinone	30 "
Sodium sulphite, dry	120 "
Water	16 ounces

No. 2.

Potassium Bromide	15 grains.
Sodium carbonate, dry	120 "
Water	16 ounces

If the crystallized sulphite and carbonate are used, take twice as much of each as the formula calls for. To develop, take equal

parts of No. 1 and No. 2. Developer should not be lower than 75° F. in winter, and not higher than 70° F. in summer, and can be used repeatedly, but should be discarded as soon as discolored, as it will then stain the film. Always develop to a good intensity, as plates developed with hydrochinone fix out somewhat. Rinse and fix.

METOL-BICARBONATE.

CRAMER.

Thoroughly dissolve

Metol	1	ounce.
Water	60	ounces.
Add sulphite of soda, crystals	6	"
Bicarbonate of soda	3	"

To prepare with hydrometer, mix:

Sulphite of soda solution, hydrometer 75°	30	ounces.
Bicarbonate of soda solution, hydrometer 50°	30	"
Metol (dissolved in 12 ounces of water)	1	ounce.

This developer has excellent keeping qualities, works very uniformly, and can be used repeatedly, without difference in the results. The bicarbonate of soda being a very mild alkali, it is not liable to injure the film or fog the plate.

AMIDOL.

Sodium sulphite, crystals	120	grains.
Amidol	20	"
Water	10	ounces.

This developer should always be used fresh.

Or:

Sodium sulphite, crystals	800 grains,	or	52 grams.
Amidol	80 "	"	5 "
Water	8 ounces,	"	240 c. c.

To develop, take four parts of water and one part of amidol solution.

BROMO-HYDROCHINONE DEVELOPER.

CRAMER.

For producing Great Contrast and Intensity, for developing Over-exposed Plates.

No. 1.

Sulphite of soda, crystals	3	ounces.
Hydrochinone	½	ounce.
Bromide of potassium	¼	"
Distilled or ice water	25	ounces.

Dissolve by warming and let cool before use.

No. 2.

Carbonate of soda, crystals	6 ounces.
Water	25 "

Mix equal parts of No. 1 and No. 2 for use.

RODINAL.

HAMMER.

Rodinal	1 part.
Pure water	30 "

Use repeatedly, adding fresh as required.

GLYCIN-PYRO.

For Transparencies, Process Plates, and Lantern Slides.

WUESTNER'S.

After having given the plate the same time of exposure as you would for iron oxalate or hydrochinone developer, place it in the following solution for half a minute:

Glycin	2 grams.
Carbonate of potassium	16 "
Bromide of potassium (5 grains)	1-3 gram.
Water	17 ounces.

Use in quantity to suit size of plate.

For a 5 x 8 plate, use 4 ounces of the above solution, and after half a minute, before the image has made any appearance, add 1½ to 2 ounces of the following solution:

Sulphite of soda, crystals	75 grams.
Pyrogallic acid	½ ounce.
Sulphuric acid, C. P	5 drops.
Water	12 ounces.

The image will appear immediately and develop quickly in beautiful roundness and extreme clearness.

It is not advisable to mix both solutions at once, as the result will not be as good as by the foregoing method, as you can control the development at will by the greater or less addition of pyro solution, which hastens or retards the development according to quantity used.

After development, rinse the positive well and fix in an acid fixing bath. With this developer the toning of the positive is unnecessary.

The color of the picture will be the same as that of a plate which has gone through a gold bath toning solution.

GLYCIN.

Glycin	5	parts.
Sodium sulphite	15	"
Potassium carbonate	25	"
Water	90	"

For use, dilute with 3 or 4 volumes of water.

TOLIDOL.

The following formulas give the proportions of chemicals required for one ounce and for sixteen ounces of water used.

One Ounce.

Tolidol	1½ grains.	
Sulphite of soda, C. P., dry	4½ "	(9 gr. crys.)
Carbonate of soda, C. P., dry	6 "	(15 gr. crys.)
Water	1 ounce.	

Sixteen Ounces.

Tolidol	24 grains.	
Sulphite of soda, C. P., dry	72 "	(or 144 gr. crys.)
Carbonate of soda, C. P., dry	96 "	(or 240 gr. crys.)
Water	16 ounces.	

For Tank Development.

Dr. John M. Nichol recommends the Standard Formula diluted with eight times the amount of water, and the addition of one drop of retarder to every ounce after the dilution.

To obtain very Strong Negatives especially adapted for Aristo Platino paper, and in order to develop in the shortest possible time, the following formula may be used:

One Ounce.

Tolidol	3 to 4 grains.	
Sulphite of soda, dry	5 "	(10 gr. crys.)
Carbonate of soda, dry	7½ "	(18 gr. crys.)
Water	1 ounce.	

Sixteen Ounces.

Tolidol	50 to 65 grains.	
Sulphite of soda, dry	80 "	(or 160 gr. crys.)
Carbonate of soda, dry	120 "	(or 300 gr. crys.)
Water	16 ounces.	

On the same brand of plates a little additional retarder will be necessary.

Engraved by
Electro Light Eng. Co.,
New York

By Don C. Scott

A CONVENTION PRIZE WINNER, P. A. OF A., 1899

ORTOL.

DR. EDER'S FORMULA.

No. 1.

Metabisulphite of potassium	7.5 grams, or	1 dram 55 grains.
Ortol	15 " "	4 drams.
Water, cold	1000 c. c. "	34 fluid ounces.

No. 2.

Crystallized sulphite of soda	180 grams, or	5 oz. 6 dr. 8 gr.
Crystallized carbonate of soda...	120 " "	3 oz.6 dr. 52 gr.
Bromide of potassium	1 to 2 " "	15 to 30 grains.
Water	1000 c. c. "	34 fluid ounces.

In winter time the bromide may be omitted. For gallery work, mix equal parts of No. 1 and No. 2. For landscapes, mix 1 ounce each of No. 1 and No. 2, and dilute with 1 ounce of water.

FIXING BATHS FOR PLATES.

Sodium hyposulphite	2 ounces.
Water	10 "

Or:

Sodium hyposulphite	2 ounces.
Acid sulphite of soda	½ ounce.
Water	10 ounces.

This bath is somewhat reducing in its action, and will be found useful in clearing muddy or stained negatives.

ANOTHER.

Hyposulphite of soda............................	2½ pounds.
Alum	2 ounces.
Water	4 quarts.

EASTMAN.

Hyposulphite of soda..........	4 ounces.
Water	16 "

Leave the plate in the bath a few minutes longer than is required for fixing. This is important, as the permanency of the negative depends upon it.

In hot weather, the best prevention from softening of the film is to make a fresh hypo bath each day just before it is needed. Laying the plate for a few minutes in a clear, saturated solution of alum just before fixing will also act beneficially.

HEMPERLEY'S.

Take thirty-two ounces of sulphite of soda, hydrometer 60°,

add to this one ounce of sulphuric acid very slowly, and eight ounces of solution of chrome alum, hydrometer 60°, then add the whole to two gallons of saturated solution of hyposulphite of soda, and it is ready for use.

Leave the negatives a few minutes longer in the bath than is required for fixing. This is important, as the permanency of the negative depends upon it. Do not use a flat tray to fix in; it causes spots and dirt. Use a grooved box.

LABORIE'S.

Bisulphite of soda	100 grams.
Hyposulphite of soda	150 "
Water	1000 c. c.

CARBUTT'S.

Sulphuric acid	1 dram,	or	4 c. c.
Hyposulphite of soda	16 ounces,	"	480 grams.
Sulphite of soda	2 "	"	60 "
Chrome alum	1 ounce,	"	30 "
Warm water	64 ounces,	"	1920 c. c.

Dissolve the hyposulphite of soda in 48 ounces, or 1440 c. c., of water; the sulphite of soda in 6 ounces, or 180 c. c., of water; mix the sulphuric acid with 2 ounces, or 66 c. c., of water, and pour slowly into the sulphite of soda solution, and add to the hyposulphite; then dissolve the chrome alum in 8 ounces, or 240 c. c., of water, and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long use, and both clears up the shadows of the negative and hardens the film at the same time.

After negative is cleared of all appearance of silver bromide, wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

CRAMER.

The negatives may be fixed in a plain hypo bath, 1 part hyposulphite of soda to 4 parts of water, but the following bath is especially recommended.

Prepare two solutions:

No. 1.

Hyposulphite of soda	48 ounces.
Water	96 " (3 quarts).

No. 2.

Water	32 ounces.
Add, gradually, sulphuric acid	¼ ounce.
Sulphite of soda, crystals	4 ounces.
Chrome alum	2 "

After the ingredients are dissolved, pour No. 2 solution into No. 1.

During the cold season, one-half the quantity of No. 2 is sufficient.

This bath combines the following advantages: it remains clear after frequent use, does not discolor the negatives, forms no precipitate upon them, and hardens the gelatine to such a degree that the negatives can be washed in warm water, provided they have been left in the bath a sufficient time.

The plate should be allowed to remain in the bath five to ten minutes after the bromide of silver appears to have been dissolved. The permanency of the negative and freedom from stain, as well as the hardening of the film, depend upon this.

Seed.

No. 1.

Sodium hyposulphite	2 pounds.
Sodium sulphite, crystals	4 ounces.
Water	96 "

No. 2.

Chrome alum	2 ounces.
Sulphuric acid	1/4 ounce.
Water	32 ounces.

Pour No. 2 into No. 1 while stirring rapidly.

Seed.

Fixing Bath for Transparency Plates.

A

Hyposulphite of soda	1 pound.
Sulphite of soda, crystals	2 ounces.
Water	64 "

B

Chrome alum	1 1/2 ounces.
Sulphuric acid, conc	1 dram.
Water	16 ounces.

While stirring A vigorously, pour in B. This bath will keep, but it should be filtered occasionally.

Wuestner.

Hyposulphite of soda	25 ounces.
Saturated chrome alum solution	5 "
Water	100 "

This bath is good until the greenish-blue color turns brown, when a fresh bath must be made.

Hammer.

Acid Chrome Alum Fixing Bath.

This may be used in hot weather, and is to be mixed in the order given; then it will always work clear.

Sulphuric acid	3 drams.
Sulphite of soda	4 ounces.
Water (about)	100 "

When this is about half dissolved, add 2 pounds of hyposulphite of soda; after the hypo is dissolved, add from 1 to 2 ounces of chrome alum dissolved in 20 ounces of water; then add enough water to make 160 ounces.

Another formula for preparing a highly concentrated "acid chrome alum sulphite solution" can be made up in any quantity, and added to the fixing solution—one ounce to each gallon of solution as needed—to harden the film in hot weather. Make a solution of sulphite of soda in water testing 60° by hydrometer; to each 32 ounces of this add 1 pound of chrome alum; when this is dissolved, add *slowly* 2 ounces of sulphuric acid.

Acid Fixing Bath.

This is better than a plain bath, and is to be mixed in the order given. Always works well and remains clear.

Sulphuric acid	3 drams.
Sulphite of soda	4 ounces.
Water (about)	120 "

Stir well until at least half of the sulphite is dissolved, and then add hyposulphite of soda, 2 pounds, and water to make 160 ounces.

INTENSIFICATION.

After fixing and washing thoroughly, immerse in a tray containing the following: 1 ounce each of bichloride of mercury and potassium bromide, dissolved in 32 ounces of water. Keep in motion until the film is evenly whitened, then rinse and apply a solution of sulphite of soda, 1 ounce, to water 10 ounces.

For very slight intensity, use above solutions diluted to suit the case.

Cramer.

Prepare a saturated solution of bichloride of mercury in water, and gradually pour of this a sufficient quantity into a solution of

Iodide of potassium	1¼ ounces.
Water	6 "

until the point is reached, when the forming red precipitate will no longer dissolve by shaking, but be careful not to add more mercury

than just enough to make the solution very *slightly* turbid. Now add

Hyposulphite of soda .... 1 ounce,
dissolve, and add water to make 20 ounces of solution.

For use, this should be diluted with about three parts of water. If the plate has not been thoroughly fixed, the intensifying solution will produce yelllow stains. Be careful not to overdo the intensifying. Should it have gone too far, the negative can be reduced by placing it in the fixing bath for a short time.

Hammer.

No. 1.

Bichloride of mercury	60	grains.
Bromide of potassium	60	"
Water	6½	ounces.

No. 2.

Sulphite of soda	½	ounce.
Water	4	ounces.

Place the negative in solution No. 1 until bleached; then rinse and place in solution No. 2 until entirely cleared; after which the plate must be well washed. This operation may be repeated if there is not sufficient intensity gained by first treatment.

Carbutt.

With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective, and the most permanent of all methods:

No. 1.

Bichloride of mercury	240 grains,	or	16	grams
Chloride of ammonia	240 "	"	16	"
Distilled water	20 ounces,	"	600	c. c.

No. 2.

Chloride of ammonia	240 grains,	or	16	grams.
Water	20 ounces,	"	600	c. c.

Let the plate to be intensified wash for at least half an hour, then lay in a 5 per cent. solution of alum for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient; then immerse negative in above No. 1 solution, observing that the longer it remains in the solution the greater will be the final density. Wash well, and flow over for a few seconds the solution of ammonium chloride No. 2. Wash after this application, and immerse in dilute ammonia water (1 dram of strong ammonia in 8 ounces of water) until the white

image is darkened through to back of plate; or in place of the dilute ammonia, a 10 per cent. solution of sulphite of soda. When darkened through, rinse well and set up to dry.

Scolik's Method.

The fixed and well-washed negative is allowed to remain in the following mercuric chloride bath until the film is thoroughly whitened:

Mercury bichloride	1 part.
Potassium bromide	1 "
Water	50 parts.

The bleaching being complete, the mercuric solution is rinsed off, and the negative is immersed in a mixture of equal parts of a saturated solution of sodium sulphite and water. Finally, wash well.

Liesegang's Method.

No. 1.

Sulphate of copper	75 grains.
Potassium bromide	75 "
Water	6½ ounces.

No. 2.

Nitrate of silver	90 grains.
Water	4 ounces.

Place negative for ten minutes in No. 1, wash it for five minutes, and immerse it No. 2 until blackened.

REDUCTION.

Dissolve 1 part of red prussiate of potash in 15 parts of water. Wrap the bottle in yellow wrapping-paper, as the solution is affected by light and will not keep long. Immerse the negative in a hypo solution—1 part hypo to 15 parts of water—to which has been added a little of the above immediately before use. When reduced sufficiently, wash thoroughly.

Seed's Reducer.

No. 1.

Red prussiate of potash	15 grains.
Water	1 ounce.

No. 2.

Hypo-soda	240 grains.
Water	16 ounces.

Take No. 1, 4 drachms, and add to No. 2.

When the negative is thoroughly fixed and washed, lay into the above solution until sufficiently reduced. Wash after immersion.

CLIMAX REDUCER.

To reduce a negative, it is immersed in a solution made by mixing equal parts of the following:

No. 1.

Red prussiate of potash	1 ounce.
Water	20 ounces.

No. 2.

Hyposulphite of soda	1 ounce.
Water	20 ounces.

Several negatives may be reduced with the same solution. If very little reduction is needed, reduce the solution by adding water. Not necessary to wash before reducing.

Cyanide Reducing Solution.

Cyanide of potassium	20 grains.
Iodide of potassium	10 "
Bichloride of mercury	10 "
Water	10 ounces.

Reduction takes place slowly and is easy to control. After reducing, the negative should be washed thoroughly.

ANOTHER METHOD.

No. 1.

Hyposulphite of soda, crystals	772 grains.
Water	8 ounces.

No. 2.

Ferricyanide of potassium	76 grains.
Water	6 drams.

To reduce, use No. 1, 5 ounces; No. 2 drams.

ANOTHER METHOD.

Potassium ferricyanide	1 ounce or 30 grams.
Distilled or melted ice water	16 fluid ounces or 500 c. c.

Keep the above solution in the dark when not in use. To reduce a negative, immerse it in hypo solution of a strength of about

one ounce of hypo to a pint of water, to which a small quantity of the reducing solution has been added. To reduce locally, immerse the plate for a few minutes in water and apply the mixed solution with a camel's hair brush to the part required. Silver stains may also be removed after wetting the plate by brushing them over with the solution. At the end, wash thoroughly. The ferricyanide solution must be added to the hypo at the time of using, as the mixed solutions do not keep.

BARTLETT'S REDUCER.

Perchloride of iron	30 grains.
Citric acid	60 "
Water	1 pint.

DEVELOPMENT POINTERS.

A developer containing a surplus of alkali effects more detail in the shadows and lessens the intensity of the high lights, which causes more softness in the negative, consequently such a developer suits well for under-exposed plates, which explains why for under-exposures a preliminary bath in a soda solution or ammonia solution is used to advantage.

A large number of developing substances, such as pyro, eikonogen, metol, hydrochinone, and glycin, quickly intensify the high lights, and hasten the development, so that the shadows remain far behind; therefore a modification by little over-exposure, dull lighting, or soft-working plates, is of good service.

The developer diluted with water slows the process of development, gives the shadows more of a chance to work through before the high lights have gained their strength, prevents contrast, and therefore is recommended for contrasty plates or under-exposure.

The old or used developer acts the same as bromide, checks the development, and clears, and is used when plates are greatly over-exposed or a general fog is apparent.

The room in which plates are handled and developed must be a perfectly dark room, save for the light from a small ruby or orange-colored window (or one containing a combination of these colors), by which the progress of development can be watched. If possible, have an abundance of pure running water, and provide good ventilation. You will have better negatives and better health by so doing.

The window in your dark-room which illuminates the sensitive plate during the process of development must be as non-actinic as possible. There is no such thing as a perfectly safe light. Any light of sufficient illuminating power to be of practical use will affect a very sensitive plate, if given time enough; it is there-

Engraved by
Electro Light Eng. Co.,
New York

LOW TIDE

By C. Chenery

fore necessary to use great care in developing. The best and safest light for your dark-room window is a combination of ruby glass and orange paper, commonly called post-office paper. This is easier on the eyes than ruby glass alone, and by its use the quality of the negative may be more easily determined. Use a lamp or gas-jet outside to illuminate the window, as it is safer and more uniform than daylight.

A soft camel's hair brush may be used to remove the dust from plates before placing them in the holder or dark slide. If the brushing is done hurriedly, the film will be instantly electrified and attract to itself more dust than you remove.

When plates are exposed and set away for future development, be sure to set them *face to face,* as they were in the original boxes. If the face or film is placed against the back, you will probably have finger-marks on the film, caused by the fingers coming in contact with the backs of the plates while placing them in the holder.

It is advisable to use a fresh solution of hyposulphite of soda each day during the hot weather. The fresh solution hardens the film, and alum will not be necessary.

Thorough fixing and thorough washing, followed by quick drying, will insure permanency and fine printing quality in the negative.

During the hot season the developer must be used more diluted and cold (by placing in ice-cold water), while *during the cold season* it should be stronger and moderately warm, about 70° F.

Developer, which is too strongly alkaline, or too warm, produces stain and fog.

As soon as *over-exposure* is noticed in developing, check it immediately by plentiful washing and finish with the regular developer, to which has been added bromide or old developer.

An *undertimed plate* should be treated with a fresh, diluted developer, and if sufficient detail does not appear, take the plate from the developer, and, without rinsing, place it in a tray containing water, to which a little of the alkaline solution (sulphite and carbonate of soda) has been added, and leave it there as long as it increases in detail. If it is not then strong enough, the development may be continued in fresh developer.

To prevent sand or rust from striking the negatives while washing, tie a piece of cotton flannel over the faucet.

Negatives exposed to white light before the bromide of silver is thoroughly dissolved in the fixing solution will be foggy, and the printing quality will be injured.

A solution of bromide of potassium (one ounce of bromide to ten ounces of water) should be in every developing room. When plates are a little over-exposed, a few drops of this solution added to the developer will restrain its action and may thus produce a good negative from what would otherwise be a worthless plate.

DEFECTS IN NEGATIVES.

FOGGY NEGATIVES.—Caused by over-exposure; white light entering camera or dark-room; too much light during development; decomposed pyro; introduction of hypo or nitrate of silver into the developing solution from the fingers or from tablets used for wet plates; developer too warm or containing too much carbonate of soda or potassium.

WEAK NEGATIVES WITH CLEAR SHADOWS.—Under-development.

TOO STRONG WITH CLEAR SHADOWS.—Under-exposure.

WEAK NEGATIVE WITH PLENTY OF DETAIL IN THE SHADOWS.—Want of intensity, caused by over-exposure. Short exposure with longer development will, in most cases, produce sufficient intensity, and the adition of more pyro stock solution to the developer will seldom be necessary.

FINE TRANSPARENT LINES.—Using too stiff a brush in dusting off plates.

TRANSPARENT SPOTS AND PIN-HOLES.—Dust on plate or in camera, or scum on old developer, or air bubbles while developing. Developer must be perfectly clean.

CRYSTALLIZATION ON THE NEGATIVE AND FADING OF IMAGE.—Imperfect elimination of the hypo.

YELLOW-COLORED NEGATIVES are caused by not using enough sulphite of sodium in developer, or if the article used is old and decomposed.

YELLOW STAINS are caused by using old hypo bath which has assumed a dark color, or by not leaving plate in hypo bath long enough.

MOTTLED APPEARANCE OF NEGATIVE is caused by precipitation from fixing bath containing alum, if the solution becomes old, or if it is turbid.

ORTHOCHROMATIC SENSITIZING BATHS.

VICTOR SCHUMANN.

Alcohol	10	parts.
Ammonia, 90°	4	"
Alcoholic solution of cyanine, 1 : 200	10	"
Distilled water	200	"

Immerse the plate in water containing a little ammonia (3 parts per 100) for two or three minutes, and then place in the above solution, drain, and dry.

MALLMAN AND SCOLIK.

Preliminary Bath.

Ammonia	2	c. c.
Water	200	"

Soak the plate for two minuates.

Color Bath.

Erythrosin solution, 1 : 1000	25 c. c.
Ammonia	4 "
Water	175 "

The plate should not remain longer in this bath than one and a quarter minutes. A longer time reduces the general sensitiveness.

Another.

Alcohol	500 c. c.
Chinoline red	1 gram.

To which add 50 c. c. of a solution of

Alcohol	500 c. c.
Chinoline blue (cyanine)	1 gram.

The above solution is identical with the liquid dye sold under the name "azaline."

Another.

Bathe the plates for about two minutes by a very feeble red light in

Erythrosin solution, 1 : 1000	50 parts.
Distilled water	100 "
Silver nitrate solution, 1 : 1000	50 "
Ammonia, sp. gr. 0.96	2 "

Keep this solution in the dark-room. These bathed plates will remain clear for about seven days.

Color Screen.

Aurantia	0.3 part.
Warm alcohol	50 parts.
Ether	50 "
Pyroxiline	2 "

Dissolve the aurantia (not aurine) in the alcohol, then add the ether and pyroxiline, and filter. Coat thin polished plate glass, and attach to inner side of lens board. If not dense enough, coat again, or use two screens together. The darker the screen the longer the exposure, but the better the orthochromatic effect.

MANIPULATION OF AMERICAN ARISTO PAPERS.

Trays.

Trays should always be large enough to enable one to wash prints without tearing.

All trays should be thoroughly cleansed before using, by scouring with bicarbonate of soda, and rinsing well with clear water.

Flattening Aristo Paper.

Herein lies the chief secret in working collodion gloss paper successfully, without fear of curling or breaking at the edges. It is perfectly easy after a trial or so. A large, smooth-bottom tray should be used, and about one-half inch of water placed in it. The prints are now taken and placed face down in this water, one at a time, by sliding them in one on top of another, and keeping them flat on the bottom. Be sure a print is thoroughly wet before another is placed on top of it. The prints should not be placed in the tray in a regular pile, as this allows the edges to curl over each other, but should be piled irregularly well over the bottom of the tray, partially covering one another.

After all prints are in, pour off water and put on fresh water. Keep prints flat and rock the tray for five minutes (this will avoid red streaks), pour off water and press them down with flat of hand, allowing all water to drain out. Now stand tray on edge and allow prints to drain for five minutes. Then pour plenty of water over them, and proceed to wash by separating prints and handling over.

Aristo Blue Label.

Printing.

Print but slightly deeper than desired when finished. Print deeper if dark tone is desired. If bold, good toning prints are desired print under two or three thicknesses of tissue. Avoid touching face of prints unnecessarily until the toning bath is reached.

Toning.

Blue label has great latitude in toning and will work in any good gold bath if not too strong. Very little gold is required. If prints tone on margin quicker than in centre, the bath is too strong, and should be reduced with water. A print should take at least six to eight minutes to reach a good warm tone. Fast toning gives weak color; slow toning a rich deposit of gold and a vigorous print. A neutral bath in which neither red nor blue litmus will change color, gives the best average results.

In sections where the water is alkaline or very hard, simply gold and water is sufficient to make an effective bath; with rain or soft water add saturated solution of borax or any of the sodas to bring the bath to a neutral point. Never use a fresh bath; make it up several hours before using, and give it time to ripen.

After Toning.

As prints come from the toning bath, throw into a tray of water made slightly acid by a few drops of acetic acid. Some prefer a slight salt solution. With small batches, running water will be sufficient.

Fixing.

Fix in hypo bath 10° to 12° hydrometer test, or one ounce saturated solution hypo to every 16 to 18 ounces of water. Have plenty of bath to cover prints thoroughly, and keep prints separated. Fifteen to twenty minutes will be sufficient time.

Final Washing.

Finally, wash carefully. It is the frequent and complete change of water that washes the hypo from a print, not continuous soaking. One hour in running water that changes completely every few minutes is sufficient, or seven or eight changes of water if prints are washed by hand.

Aristo Junior.

Print about two shades darker than desired when finished Flatten prints as directed, and wash through six changes of clear water, handling prints over each time, then tone in the following bath:

Salt	30 grains.
Saturated solution of acetate soda	½ ounce.
Aristo gold	1 dram.
Water	60 ounces.

Sal soda or borax, enough to turn red litmus paper blue in four or five minutes.

Make this bath up from four to five hours before use. Add gold enough to keep speed of bath six to eight minutes.

Tone in this bath to any point you desire prints when finished. After toning place in clear water. When ready to fix, rinse thoroughly through two clear waters.

Fix in plain hypo, 15 grains by hydrometer test, for fifteen minutes. Wash one hour in running water. Mount with any good fresh paste and dry quickly.

Note 1.—In cold weather always temper all water to about 65° or 70°.

Note 2.—The salt in the toning bath restrains the high lights from overtoning, and brings the high lights and shadows up clear at the same time, also saving the fine detail in white drapery.

Note 3.—Acetate of soda is a neutral salt. It will not make bath alkaline.

Note 4.—Muddy shadows and yellow whites and lack of brilliancy mean that your bath is too alkaline. Blue edges to the vignettes and bleaching in toning bath signifies an acid bath. Remedy: Add a few drops of alkali.

Printing.

Aristo Platino paper, in a general way, should be printed plain. Print until the high lights are well tinted. Pay no attention to the shadows, no matter how much they bronze. Do not be afraid of printing too deep.

Washing.

Wash through six changes of clear water, handling prints over each time. In washing paper there are two things to eliminate: the free silver and the keeping chemicals, and unless prints are thoroughly prepared for toning, they will not tone thoroughly and evenly.

The Gold Bath.

When prints are thoroughly washed, tone in the following bath to a purple, not a blue:

Salt	30 grains.
Aristo Gold	1 dram.
Water	60 ounces.

Borax enough to turn red litmus paper blue in three or four minutes.

The gold toning bath should be made up from four to five hours before use. Add enough gold to keep speed of bath six to eight minutes. Do not make the bath too strong, as the print will tone before the whites clear up. If prints show bleaching in the whites, add a little more alkali. An acid toning bath bleaches out the detail in the whites, and also makes pink whites in the finished prints. But a too strongly alkaline bath gives yellow whites. See note on "Gold Toning Baths," page 233.

The character of platinum tones is controlled in the gold bath. If prints are taken from the gold bath a chocolate brown, they will make beautiful olive tones. Prints toned to a purple will make black tones, and prints toned to a blue will make blue-black tones. By bearing this in mind it is possible to get any tone desired. But in every case tone far enough in the gold bath to thoroughly clear the whites. After toning, throw prints into clear water until all are toned.

Washing After Gold Bath.

Wash prints in three changes of clear water by handling prints over. Do not try to wash by placing in running water. It will not do it. It is very important to wash prints thoroughly after they come from the gold bath; to wash out any free gold that may be on the prints, as gold precipitates platinum, and unless prints are well washed, the platinum will be precipitated on the bottom of the tray, and not on the print. Again, never use the

regular gold toning tray for platinum bath, as all such trays have more or less gold deposited on bottom and sides, and this will precipitate your platinum also. It will not only waste platinum, but prints toned through both baths in same tray will tone down to a muddy blue-black, and if kept in long enough the whites will turn yellow.

Toning in the Platinum.

After prints are washed, tone in the following bath;

Aristo platinum ....3 to 5 drams.
Water ....60 ounces.

Add platinum enough to keep speed of bath from eight to fifteen minutes.

A mistake photographers have made in toning Aristo Platino with platinum is, they have not toned long enough in the platinum bath. When prints first go into this bath the whites become muddy. But in a short time they commence to clear up. And by keeping prints in this bath until the whites are thoroughly clear, and every trace of brown or purple is out of the deepest shadows, you will get most beautiful effects. Don't be afraid of leaving them in the platinum bath until the desired color and richness you wish is obtained.

When prints come out of the platinum bath it is very important to wash them thoroughly through three changes of water before fixing, because the platinum bath is extremely acid, and it is absolutely necessary to wash the acid out of the prints; if you do not, you carry it into the hypo, and produce sulphuration and yellow whites. This is the reason that all hypo baths containing much alum or acid hardeners are dangerous, as the acid releases the sulphur in the hypo and produces sulphuration in the prints that will ruin them sooner or later—and the photographer also.

After prints are washed, fix in plain hypo, 18 grains strong, hydrometer test, for fifteen minutes, and then wash by hand through ten or twelve changes of water, and they are ready to mount.

Using Platinum Bath Over.

One-half the old platinum bath with one-half fresh bath added, and used over the next time, makes richer tones than a fresh bath. See note on "Platinum Toning Baths," page 235.

Pink Whites.

Pink whites are caused by not having the gold bath alkaline enough. They are also caused by washing and toning prints in a strong light.

Yellow Whites.

Yellow whites may come from prints not being toned far enough in the gold bath, or from too much alkali in gold bath, or from

trying to wash prints in running water, between gold and platinum baths, or between platinum bath and hypo. Running water will not do. Prints should be washed by hand and the water changed.

Weak Prints.

Weak looking prints very often come from not printing dark enough. Try three prints, one as you have been printing, the second a shade darker, the third darker still; tone them all out, select the best, and you have the depth to print.

Weak looking prints more often come from improper toning in the gold bath than any other cause. Always tone in the gold bath until the shadows are a warm brown (for olive tones). If the whites have cleared, and are in danger of bleaching, add more alkali to hold back the whites until the shadows tone. Never take them out a bricky red in the shadows. If you do you are in danger of having weak, muddy shadows, and a dirty olive tone out of the platinum bath. If you desire rich, strong shadows out of the platinum bath, you must have rich, strong shadows out of the gold bath.

Weak prints often come from thin, weak negatives. Weak prints can come from printing in the cold, chilling the paper and negatives, and can be prevented by printing in a warm place.

Slow Toning.

Slow toning in platinum bath is often caused by not using the proper kind of phosphoric acid in making up the platinum toning solution. Use full strength phosphoric acid, U. S. P. 1890. You cannot be too careful. It is better, however, to use Aristo Platinum for the best results.

Slow toning in platinum bath is very often caused by the water you use, very alkaline water precipitating the platinum. See remarks on " Water," page 239.

Black Spots.

Black spots are caused mostly by small particles of iron rust in the water, and generally come from the inside of the water pipes, from iron pumps, or iron roofs. This trouble can be helped by using a filter. A piece of chamois over your faucet will generally prevent the trouble.

White Spots.

White spots are caused by insufficient handling in hypo bath and by not handling in the washing water after fixing; also by not drying fast enough. Sometimes they are caused by drying between cheap blotters and newspapers.

Engraved by
Art Engraving Co.,
St. Paul, Minn.

By Moore & Stephenson

FROM CONVENTION PRIZE EXHIBIT
P. A. OF A., 1899

Rubbed Places.

Rubbed places on face of prints which do not show until prints are dried, are caused by rubbing the face of the prints on the bottom of the tray during washing and toning. When you have this trouble handle your prints face up.

Rubbed or marred places on the face of prints may also be caused by heavy pressure of fingers on the back of prints when pouring off washing waters.

SEPIA TONES.

To make sepia tones on Aristo Platino, print about two shades darker than desired when finished. Wash through two changes of clear water; then place prints in a strong salt solution—2 ounces of salt to a gallon of water. Keep in salt water for five minutes, until they redden up. Then wash through two more changes of clear water, and tone in the following bath:

Aristo Gold .... ½ dram.
Water ....60 ounces.

Sal soda enough to make red litmus turn blue in ten minutes.

Work this bath just slightly alkaline. Just clear the whites, and place in stop solution of salt water, after which fix for fifteen minutes in hypo bath, 10° hydrometer test. Add two ounces salt to each gallon of fixing bath. No matter if prints do look yellow in fixing bath, they will come all right in the washing and drying.

Another Way.

Print about two shades darker than desired when toned. Wash through five changes of clear water, and tone in a plain gold bath.

Aristo Gold .... ½ dram.
Water .... 60 ounces.

Work this bath just slightly acid. Keep prints in this bath just long enough to clear the whites, then place in clear water and wash through one water.

To the same gold bath add another half dram of Aristo Gold. Now add alkali enough to turn red litmus paper blue in a couple of minutes. Place prints back in this bath and tone the shadows to the point you desire when finished. When toned place in clear water and fix in a plain hypo bath, 12° hydrometer test, for fifteen minutes. All papers for sepia tones should be at least thirty days old.

Gold Toning Baths.

In toning in the gold bath it is important to watch several points. One of which is to see that the high lights and shadows are both toning equally. It is a good plan to look through the print by transmitted light, and if you find the same tone as appears on the surface,

you are toning down into the emulsion, and your tones will hold in the hypo bath. But if the print looks purple on the face, and when you look through it the shadows look red, you can depend upon it you are getting only a surface tone, and when the print goes into the hypo the surface tone will cut off and you will have the tone you see looking through. The reason is, you have not washed all the free silver off your print, your gold is depositing in this free silver, and when the print goes into the hypo bath the free silver cuts off and takes your tone with it. By the use of salt in the gold bath you avoid this. The salt also restrains the high lights from overtoning, and enables the shadows to tone up at the same time. The salt also saves the fine detail in your white drapery.

Should you find in toning that your whites are bleaching, it is because your bath is not alkaline enough, so add a few drops of alkali. On the other hand, if your prints refuse to clear up, and tone out dead and flat, it is because your bath is too alkaline, in which case add a little acid gold or a drop of citric acid. In toning Aristo Platino paper, if you do not have your gold bath alkaline enough, you will get pink whites in the platinum bath. Always remember pink whites mean that your gold bath was not alkaline enough.

It is impossible to give the exact amount of alkaline to use. Almost all waters are alkaline. The litmus paper test must guide you in this. Study and test the water you work with, and you will not have any trouble in making nice prints. All gold baths should be made up from four to five hours before use, and a good plan is to make up a fresh bath after you get through toning for use next time, only adding enough gold to ripen the bath (about 1 grain); when ready to tone, add gold enough to make speed of bath six to eight minutes, and the proper amount of alkali. A ripened bath will work much smoother than a fresh one. Many printers like to use one-half old and one-half new bath. Acetate of soda will not have any effect on a toning bath, unless added one hour before use. Acetate of soda will always keep your tones rich and brilliant. In making up a gold bath remember that neutralizing with sal soda gives warm tones; borax gives brown tones, and bicarbonate of soda gives purple. Borax is generally used because it is the weakest alkali, and a few drops more or less will not get one in trouble as quickly as the stronger sodas. In some waters it is best to use sal soda as an alkali for the gold bath, as borax may give muddy shadows. If borax is found to give this result, try sal soda, but remember that sal soda is a very strong alkali, and should be used cautiously. When the water you use is alkaline, it is best to use a very acid gold and acidify your toning bath first. Then add borax or sal soda to bring it up alkaline. The reason for this is that the alkali found in the water is a lime alkali, and is not the proper kind of alkali to use, and will not give satisfactory tone. The Aristo Gold will be found best in all such cases.

Platinum Toning Bath.

The formula gives 60 ounces of water and 3 to 5 drams platinum solution. Of course, it depends on how many prints there are to tone. So the best formula to follow will be to place enough water in the tray you expect to use and add about three drams of platinum solution to start on. The speed of this bath should be from eight to fifteen minutes. If necessary add more platinum until you get it, for it is platinum and not water that tones.

A print slightly toned in the gold bath will take more time and platinum to tone in the platinum bath. If a print be left very long in the gold bath and toned hard in a strong platinum bath, it will be a strong olive, as overtoning with platinum gives greenish or olive-black. If you tone to a purple and deposit a good lot of gold on the print, it takes less platinum and time to tone, and will remain a pure black. Too slow toning in platinum bath flattens the whites and has a tendency to muddy the shadows. The platinum bath is very acid. Use only one-third to one-half old bath over. If you use all the old bath over, and all the acid is left in the old bath, and you keep adding fresh platinum solution, you will get it too acid, and are in danger of cutting out the high lights of your prints.

Aristo Platino and Junior with Single Toner.

Printing.

The printing should be fully as dark as for double toning; print until the high lights are well tinted. Pay no attention to the shadows, no matter how much they bronze. Too light printing gives weak and bleached looking prints when finished.

Washing.

Prints should be washed in eight changes of clear water before toning to thoroughly remove all free silver. Handle prints over in each wash water; letting prints lie in running water for half an hour without handling is not as good, as some of the prints will not thoroughly wash.

Toning Bath.

After washing, tone in the following bath:

Single toner	2 drams.
Aristo Platinum	1 dram.
Water	32 ounces.

Prints should be toned in this bath until all trace of red has disappeared from the deepest shadows. If the toning is not carried fully this far you will not get pure whites or clear shadows, but prints will come out after fixing a dirty, muddy green color, with no brilliancy.

Washing After Toning.

Throw prints from toning bath into clear water until all are toned. Then wash in four changes of clear water, handling prints over in each wash water to thoroughly eliminate all acid before fixing. Then fix in a plain hyposulphite of soda bath, 18 grains strong to the ounce, hydrometer test, for twenty minutes, handling prints during fixing to insure perfect results. After fixing, wash in ten to fifteen changes of clear water, or one hour in running water, handling prints over occasionally to insure thorough washing.

Single Toner on Aristo Junior.

In toning Aristo Junior in the single toner for olive black tones, it is handled just the same as Aristo Platino, with one exception, flattening prints in the first wash water (see note on "Flattening Collodion Papers"). In handling Aristo Junior and toning in the single toner, print fully as dark as for Aristo Platino. The prints will tone some slower than platino, owing to the heavier gloss surface, but when finished and burnished with a hot burnisher will give a beautiful rich, olive-black print, equal to any gloss carbon made, fully as permanent and much finer than any gold-tone print.

SOME THINGS NECESSARY TO REMEMBER.

NOTE 1.—In many places the water is impure, and red spots make their appearance. In trouble of this kind, add to every gallon of the first wash water two ounces of a saturated solution of sal soda. Handle prints over in this water five minutes. It will do very little good in any but the first wash water.

When using the soda in the first wash water with Junior paper, after the prints are all in, rock the tray for a few minutes, keeping prints flat, then pour soda water off and put in fresh water. Rock tray for five minutes and pour off water. (Repeat if necessary until the milky look of the water has disappeared.) Now flatten prints. After prints are flattened, wash as directed.

NOTE 2.—If prints, when put into the toning bath, bleach or cut out the high lights, spoiling the delicate half-tones, the addition of from one to two drams of Aristo Platinum solution to the toning bath will remedy the trouble.

NOTE 3.—Your toning bath can be strengthened by adding two drams of Aristo Platinum solution and one dram single toner, always watching your bath to see that it is working right.

NOTE 4.—When bronzing shows in the shadows, after prints are finished, the best remedy found is the sal soda in the first wash water. It softens the emulsion enough to allow the silver to wash out more freely in the heavy shadows, as well as allowing the toning

bath to penetrate the same, and thus remove the trouble. See Note 1.

NOTE 5.—The best results are obtained by using fresh toning bath every time.

NOTE 6.—To remove red spots on prints, after they are toned with single toner, dilute the stock single toner solution with equal parts of water, and apply to spot, but not until print is fully toned.

NOTE 7.—Prints should be thoroughly washed in four changes of water after toning, before fixing, as the toning bath is very acid, and if this is carried into the fixing bath it is liable to cause muddy whites and prints with no brilliancy.

NOTE 8—Never use your platinum tray for anything but single toner and platinum toning.

NOTE 9.—All wash waters and toning baths should be kept at a temperature of 65° to 70° during cold weather.

Hypo Bath.

In making up hypo bath always use hydrometer to test. For Junior and Blue Label use fifteen grains hypo and fix fifteen minutes. For Platino paper use eighteen grains hypo bath. If you wish to fix Junior and Platino together, make the hypo bath fifteen grains strong and fix fifteen minutes. A thoroughly fixed print is easily washed, but too long fixing is as bad as too little, as it bleaches your prints and destroys the brilliancy.

Final Washing.

After all prints come from the hypo bath it is necessary to handle them through at least two waters by hand before putting them in running water or washing-box. By doing this you wash off the surface hypo and also little air bubbles that sometimes fasten themselves on the print, and hold the hypo under them, allowing it to go on bleaching, thereby getting little white spots on the prints when they come from the wash water that were not there when they were fixed. After two waters by hand, one hour in running water or ten to twelve changes by hand is sufficient washing.

Red Spots.

Red spots on paper can come from a number of causes. The most common forms are finger-marks, bubbles, and preservative chemicals still in the paper. When from finger-marks they can be easily recognized.

When the spots are round or oblong and have defined edges, they are from bubbles, and can be avoided by sliding prints in the first water and knocking them off. If the red spots are uneven and scattered over the paper, or if the prints act like they were greasy.

when they are in the washing water, the trouble comes from oil or grease, which may come from the hands, trays, or water.

This trouble can be overcome in both Platinum and Junior paper by adding two ounces saturated solution sal soda to each gallon of water the first water prints are placed in, handling prints over in this water for five minutes.

This alkali cuts off all oil or grease on the prints and neutralizes the acid preservative chemicals in the paper, the six changes of clear water afterward washing out all trace of the alkali, and bringing your prints up to the gold bath in a perfectly neutral condition.

Any red spots after gold toning on platino paper can be removed by rubbing some of the stock platino solution on the spot with finger as the print goes in platinum bath. The spot darkens, and the rest of print tones up to it. There is no necessity for losing prints from red spots.

When using the soda in the first wash water with Junior paper after the prints are all in, rock the tray for a few minutes, keeping prints flat. Then pour soda water off and put on fresh water. Rock tray for five minutes. Pour off water. (Repeat, if necessary, until the milky look of the water has disappeared.) Now flatten prints. After prints are flattened, wash as directed.

Fresh Paper.

When paper prints brown or purple, with muddiness in the half-tones, it is quite fresh, and should be put in a warm place (near a radiator for a few days). Paper treated in this way will soon print a rich, red color. Fresh paper must be printed darker than older paper, which prints a cherry red. When paper prints a weak red color in the shadows during cold weather, it is because it is chilled, and the chemical action does not take place freely. Always print in a warm temperature if you wish the best results. In the winter, paper thirty days old is much better than very fresh, older paper giving stronger and richer prints than fresh paper.

Bronzing.

Bronzing in the shadows is generally caused by not toning the shadows properly in the gold bath first, and not far enough in the platinum bath afterward.

Blisters.

Blisters are caused by a change of temperature in the baths or water, and they usually come in the hypo or afterward. Adding fresh hypo will reduce the temperature of the water. Putting the prints in cold hypo bath and from there into warmer water again is what brings on blisters. It can be helped by throwing prints in a salt water after hypo, but the best plan is to temper the hypo or keep it in a saturated form, and reduce it as you need it. Another plan is to gradually

reduce the hypo bath by pouring off part of it and adding water, repeating until down to clear water.

Hydrometer Test.

When sodas come from chemical works in crystal form they contain a very large per cent. of water of crystallization, and the conditions under which they are kept have a great deal to do with their strength. If they are kept in a warm, dry place, the water of crystallization dries out and they become much stronger. When sodas are weighed by scales you can never tell anything about them. Always test all sodas in solution by hydrometer. It is well to often test your hydrometer by washing thoroughly and filling with plain water. If the stem stands at zero in the water it is O. K. If it sinks below, and tests stronger, it is "off"; to remedy, tap the small end of the hydrometer on a board and jar the paper in the stem down. Keep testing until it is at the right point.

Litmus Paper.

One of the most important things in a toning-room is litmus paper. Only buy the best, put up in glass tubes. Never allow any one to sell you a litmus paper that has a hard, solid body. Always use a soft litmus paper that the solution can take hold of at once. Use red litmus paper to test for alkali, and blue paper to test for acid. The length of time it takes to turn red litmus paper blue, or blue paper red, will denote how strongly alkali or acid the solution is. Always keep litmus paper in well-stopped bottles, as light or air will affect the sensitiveness of it, and never mix the blue and red.

Water.

The water used is of the greatest importance, and there is entirely too little attention given to it. After having tried the water over the larger part of the United States, we find lime, magnesia, plaster of paris, sulphur, iron, and many other things contained in it. When we remember that toning and developing are very delicate chemical operations, it is a source of wonder the results obtained are as good as they are.

When a gold bath is made with water that is strongly alkaline the prints will be muddy and flat, and lack brilliancy; and in the platinum bath the results are even worse, precipitating the platinum, causing slow toning and a waste of materials. In the hypo bath it is often the cause of yellow whites. It is very important that we clear the water of these chemicals as far as possible, if we desire to obtain the best results. A very simple and easy way to do this is to get an empty whisky or alcohol barrel, remove the head, clean barrel thoroughly, and fill with water. Dissolve a tablespoonful of ground alum in a cup of hot water and pour into the barrel of water; stir thoroughly and allow to settle for twenty-four hours.

Use this water for first washing, for baths, and all washing between baths until after the prints come from the hypo, when they may be washed in the regular tap water.

There is very little water west of the Mississippi River that could not be improved by this treatment, especially where it comes from artesian wells. When water is heavily charged with magnesia or iron it is best to use other water until prints are out of the hypo.

Any trouble you may go to in your efforts to obtain pure water will pay you a hundredfold in time, material, and results, and this means money.

Quality of Negative.

There is a vast difference of opinion as to what a first-class negative consists of, but all printers will agree that the best negatives are the ones that give the best results under the printing light. A negative should be clean, clear, soft, and brilliant, and, above all, have pluck and roundness. Many negatives are spoiled in developing, by not being developed far enough, many thinking a half-developed negative is meant when a soft negative is spoken of. A negative should always be developed far enough to have body and strength enough to hold the roundness and brilliancy under the printing light. A negative developed so thin that the arch of the high light has not strength enough to hold up under the printing light will never make anything but a flat, disappointing print, on any kind of paper. The utility of the negative to do the work required of it, that is to make prints (not to look at), depends largely on the developing agent used in making it. We have often been given beautiful negatives to look at, but were much disappointed in the prints of the same. The beautiful little catchy lights on drapery seen in the negative were not in the print, but everything seemed flat and grayed down. We find negatives made with some developing agents do not have the quality to stand up under the printing light that others do. The high lights are not opaque, but the film seems porous and allows the light to filter through the negative and gray down the delicate catchy points of light and half-tones, and the result is a disappointment in the finished print. The best negatives we have found to do the work have been developed with pyro. There may be others just as good, but we have never found them. In making a negative, the ability of that negative to make prints should be the question. For it is not the negative you sell your customers, but the prints from the same. The negative is only the means to an end. and if it does not accomplish that end it is not desirable.

A good negative must be full timed and with sufficient density (not intensity) to be a moderately slow printer, as this character of negative prints deep enough to give sufficient deposit of reduced silver to tone well down in the print.

Engraved by Western Engraving Co., St. Louis, Mo.

By W. N. Brenner

FROM CONVENTION PRIZE COLLECTION, P. A. OF A., 1899

Plain Prints.

All plain prints should be printed either in the shade, under tissue or ground glass, and not in direct sunlight, as printing in the sun produces a surface print, with no depth of brilliancy when finished. Weak negatives can be very much improved by printing in the shade under green tissue paper. If in the sun, put a white tissue paper over the green.

Cracked Negatives.

Many negatives are lost every year through no fault of the printer by being cracked. If the film is not broken, perfect prints can be easily gotten off without any trouble in the following manner:

Take a clean glass and place in printing frame, then cut a piece of plain albumen paper (not silvered) the size of negative, and place face down on the glass in printing frame (so the albumenized side will be facing out when frame is closed). Now place negative in frame on top of albumen paper, put at least two thicknesses of tissue paper on front of the frame, and put on printing paper, and print square in the sun. If it shows a line, add another tissue. This will print much faster than you think, and will not give you any bother, and is guaranteed to work every time if the film is not broken. If you have no albumen paper, use the Baryta coated paper that comes around the Aristo paper.

BURNISHING.

For the gloss prints, the highest finish is produced by a very hot burnisher. Use pure Castile soap, rubbed on dry with flannel cloth or tuft of cotton.

For platino prints, run through cold burnisher. If mounts split, warm burnisher just enough so you can hold your hand on the polishing roll, and it will prevent splitting. Use plain white cardboard between print and polishing roll.

Paper Sticking to Negative.

The trouble is caused by the paper sweating and sticking to the film, and can be overcome by using a felt pad back of your paper in printing frame. A better scheme is to varnish negatives with Aristo Adamantine varnish.

FOR VELOX PAPER.

PRINTING.—Open package of paper by gaslight or very subdued daylight.

An average negative requires ordinarily an exposure of from one to eight seconds to diffused daylight a few feet away from northern

window; electric arc light requires about the same exposure. Welsbach gaslight needs several seconds more than an arc light; an ordinary gas jet, or a kerosene lamp, at a distance of three or four inches from negative, will yield a print in one or two minutes. Very dense negatives require much more time, while very weak ones require less. All "Special" Velox papers require less exposure than ordinary Velox. Use a strip of paper to ascertain the proper length of exposure before proceeding with regular printing, and keep your printing-frame always at the same distance from the light.

DEVELOPING.—After exposure, develop with any of the developers given below, at a safe distance of a few feet from an ordinary gas or lamp light. Ruby light is absolutely needless.

ESSENTIAL CONDITION OF SUCCESS.—Use strong and fresh developer, with just enough bromide to insure pure whites. More bromide gives greenish blacks. Before developing dip the sheet of paper for one or two seconds in water.

With any of the indicated developers development is very quick, except with "Special" Velox, and takes only a few seconds. In fact, you do not need a tray, as the exposed print may be put on a glass plate, and the developer spread abundantly and uniformly over its surface by means of a brush or a tuft of cotton. The image will appear suddenly; somewhat more slowly for all "Special" Velox papers. As soon as it is strong enough, dip quickly in water and throw into the following:

Hypo Acid Fixing Bath.

Hypo	16 ounces.
Water	64 "

Then add the following hardening solution:

Sodium sulphite, crystals	½ ounce.
Acetic acid, No. 8 (or about 4½ B)	3 ounces.
Powdered alum	½ ounce.
Water	5 ounces.

This mixture keeps perfectly clear, and can be made up any time in advance. It can be used as long as it is strong enough.

Keep your prints moving in the fixing bath during the first few seconds, so as to insure uniform and thorough fixing, thus preventing stains and yellow whites.

Fix ten or fifteen minutes, then wash from twenty minutes to one hour in running water. Longer fixing in summer may turn the prints brown. Imperfect washing will produce fading prints.

Developers.

Any of the following formulas may be used with success. Be sure, however, to have your chemicals pure, especially your sulphite, and not to let your developer become spoiled by oxidation; therefore, keep it in small, well-stoppered bottles, filled to the

neck. Rubber stoppers are recommended. Too weak a developer, or one that is oxidized or contains too much bromide, will give greenish or brown blacks.

It is almost invariably necessary, in order to prevent foggy or stained whites in prints, to add a small quantity of a 10 per cent. bromide of potassium solution to the developer. This quantity will vary according to purity of chemicals and water. "Special" Velox can stand more bromide and further dilution than ordinary velox.

Metol-Quinol.

Metol	7 grains.
Sodium sulphite, crystals pure	½ ounce.
Hydrochinone	30 grains.
Sodium carbonate, desiccated	200 "
10 per cent. bromide of potassium solution, about	10 drops.
Water	10 ounces.

If crystallized sodium carbonate is used, take 400 grains.

Amidol.

Sodium sulphite, crystals pure	200 grains.
Amidol	20 "
10 per cent. bromide of potassium solution, about	5 drops.
Water	4 ounces.

Metol.

Metol	25 grains.
Sodium sulphite, crystals pure	½ ounce.
Sodium carbonate, desiccated	120 grains.
10 per cent. bromide of potassium solution, about	20 drops.
Water	10 ounces.

If crystallized carbonate of sodium is used, take 240 grains.

CAUSES OF NON-SUCCESS ON VELOX PAPER.

Grayish whites: Lack of bromide in developer. Add a few more drops of a 10 per cent. bromide of potassium solution. May also be caused by trying to force the development of undertimed prints. Possibly light-struck paper.

Greenish or Brownish Blacks: Too weak or too old developer; too much bromide in the developer; oxidized developer; over-exposure. Take a more concentrated developer or use less bromide. Strong and fresh developer can stand more bromide than a weak one without giving greenish blacks.

Contrasty Prints: Negative too harsh; make softer negatives. Use "Special" Velox, which works softer. Short exposure with "Special" Velox will still further decrease contrast.

Lack of Contrast: Negative is too weak. Use ordinary Velox, which gives more contrast. If you use "Special" Velox, you can increase contrast by giving longer exposure, and by diluting your developer and adding more bromide.

Prints too Weak: Under-exposure or developer too weak. Too weak a negative.

Prints too Black: Over-exposure. See also "Grayish Whites."

Yellow or Purple Stain sometimes Irregular in Shape: Developer not spread uniformly over the prints or too long a time elapsed between developing and fixing. When fixing, you should immerse completely in the acid hypo, and keep your prints moving during the first few seconds after immersion. Stain all over the film is the result of trying to force the development of undertimed prints; or too weak a developer; or incomplete fixing; or insufficient washing after fixing; or wash-water containing iron. In case of incomplete fixing or incomplete washing, the prints will have a sweet taste. Rinse prints before fixing.

Blisters: Prints have been creased or broken while washing. Do not allow water to run directly from the tap on to the prints. Add some alum to your hypo so as to harden the film. Too much acid or too strong hypo may cause this, and dilution of same may avoid it. Too great a difference in temperature between the baths or wash-water may give rise to them.

Discoloration around the Edges: If the centre of the print is clear, it indicates that the paper has been kept in a place where it has been submitted to chemical emanations (ammonia vapors, illuminating gas, sewer-gas, etc.). May be caused also by not spreading the developer evenly and abundantly over the prints.

Round White Spots: Air bubbles on the surface of the paper, which may be removed by means of the finger while the print is developing.

White Deposit all over the surface of the print is due to milky hypo bath. Can be removed by means of a damp sponge. Use clear hypo bath.

Picture Developing Irregularly ("Freaks") and appearing to be covered with irregular greasy streaks, as if the paper were not coated uniformly or had been touched with greasy fingers: This defect occurs while developing, especially with glossy and "Special" Velox, and is the result of the use of impure sulphite which contains sulphate. Too dilute a developer may cause the same defect. Soaking the paper in water before developing will avoid it, in case concentrated developer or pure sulphite is not at hand.

Picture is good, but surface is covered with Marks running in one direction which looks like Pencil Marks: This defect occurs mostly with glossy velox, and is the result of pressure or friction. It can be avoided to a certain extent by increasing the amount of bromide in the developer. These surface-marks can easily be removed from the dry print by rubbing the same with a tuft of cotton

dipped in wood alcohol. On matt Velox, surface stains can be erased by means of a soft rubber.

Same negative and same developer may give different results on different grades of Velox, and in each case the developer must be made to suit the paper by adding enough bromide so as to obtain pure whites, and by using the developer strong enough for obtaining good blacks.

If the above indications do not enable you to locate the trouble, please send us in one of the defective prints or one of several of the unexposed sheets, marked with your initials on the back and properly wrapped in non-actinic paper to prevent the same from becoming light-struck.

DIRECTIONS FOR USING EASTMAN'S ROYAL BROMIDE PAPER.

Concentrated Solution.

The concentrated stock solution is prepared by dissolving in succession:

Sodium sulphite, crystals	3 ounces.
Amidol	½ ounce.
Water	12 ounces.

Enough of this stock solution should be prepared at one time for one day's use.

To develop.

Take in a suitable tray:

Concentrated stock solution	1½ ounces.
10 per cent. solution bromide of potassium	8 drops.
Water	6 ounces.

Use cold. After exposure, soak the paper in water until limp, and brush lightly over the surface while wet with a tuft of cotton: then immerse in the developer.

The image should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer, and rinse the print thoroughly with pure water. If the print has been over-exposed, a small quantity of a solution of bromide of potassium should be used as a restrainer.

(NOTE.—The above developer can be used over by the addition from time to time of some fresh developer. If, however, the restrainer solution has been added to it, the developer should not be used again except for prints that are known to have been over-exposed.)

Immerse print for ten minutes in the

Fixing Bath.

Hyposulphite of soda	3 ounces.
Water	16 "

After fixing, wash thoroughly two hours, and hang up to dry.

Important Details.

With a glass tray, seven ounces of developer are sufficient for a 25 x 30 print.

CLEAN DISHES—CLEAN HANDS.—The faintest trace of hyposulphite of soda or of pyrogallic acid is fatal to good results with bromide paper, and the operator cannot be too careful to avoid any contamination.

Do not use concentrated solution more than twenty-four hours old.

Fresh hypo solution is required for fixing each batch of prints.

The washing must be thorough after fixing.

Mealy prints are caused by over-exposure.

Other developers (except pyrogallic acid and iron) may be used to develop Eastman's Royal Bromide papers, formulas for the use of which accompany the chemicals.

We recommend amidol on account of its producing the most uniformly satisfactory results.

Contact Printing.

Daylight, gas, lamp, or candle light may be used.

The exposure varies with the intensity of the negative and the quality and intensity of the light, but may be approximately stated to be, using as thin a glass negative or film as will make a good print, one second by diffused daylight, or ten seconds at a distance of one foot from a No. 2 kerosene burner.

Owing to the broad effects and the rough texture of the paper, we do not recommend Royal Bromide for prints smaller than 8 x 10.

Enlarging.

If one has a weak negative to enlarge by daylight, a strong print may be obtained from it by varnishing the back with ordinary negative varnish, slightly tinted with a yellow aniline dye. Where many such negatives have to be treated, separate glasses tinted to various shades of yellow may be employed, one of these glasses being put directly behind the negative, between it and the source of light. Only a very slight yellow tint is required to increase the contrast in the resulting print to a marked degree.

A glass tinted with blue varnish will reduce contrast.

Mounting.

ON CARD.—Royal bromide prints should be mounted wet. Lay

the wet print face down on table covered with oilcloth or rubber cloth or sheet of glass, and squeegee off all the surplus water; then brush over the back with thin starch paste; lay the print on the mount; then cover the print with a clean piece of cotton cloth, and rub into contact with a soft cloth.

Cloth Mounting.—Enlargements are usually mounted on cloth-covered strainers as follows: Take a frame, such as artists use for stretching canvas, and cover it with common white cloth; put the cloth on dry, stretching it tight, and tacking along the edges. Lay the wet print face down on table covered with oilcloth or rubber cloth or sheet of glass, and squeegee off the surplus water; then brush over the back with thin starch paste, give the cloth on the strainer a coat of paste, lay the print on the strainer; then turn the strainer and print over, and lay face down on table or glass, and rub in contact with soft cloth; then turn the strainer over and cover with a clean piece of cotton cloth and rub in contact with hand or soft rag; rub under the frame with a paper or palette knife, and remove what paste may have come through the back of cloth under the frame, or the inside edges of strainer will show through. When dry, the print will be stretched smooth and tight.

Straightening Unmounted Prints.—After drying, prints may be straightened by the scraping action of a sharp-edged ruler applied to the back, the corner behind the ruler being lifted as the ruler is passed along.

FOR SEPIA TONES ON EASTMAN'S ROYAL BROMIDE PAPER.

Hypo Toning Bath.

Directions.

By using the following formula, rich brown and sepia tones can be readily obtained. The tones produced are believed to be permanent, and not subject to the bronzing in the shadows which occurs in bromides toned with uranium. For the best results the prints should be *slightly* overtimed and have short development.

After prints are fixed and washed they may be transferred direct to the toning solutions; it is, however, preferable that they should be dried first and then toned, as there is less liability to frill and blister.

Formula.

Hyposulphite of soda	20 ounces.
Ground alum	4 "
Hot water, not over 150° F.	1 gallon.

Dissolve the hypo in the water first, then add the alum slowly. When all is dissolved, the solution should be milk white. This solution should not be filtered, and must be mixed twelve hours before use.

First Hardening Solution.—Previous to toning, prints should be immersed for five minutes in a solution of above formula, which is to be used at a normal temperature of about 65° or 70° F.

Brush lightly over the surface while in first hardening solution with a tuft of cotton before placing in hot toning bath.

To tone, take a suitable quantity of above mixture, heat to 130° F., remove prints directly from cold solution to warm solution, where they should remain until the desired tone is obtained; transfer to

Second Hardening Solution:

Alum	2 ounces.
Water	70 "

Finally, wash thoroughly.

The object of putting the print in a cold toning bath first is to harden the gelatine before putting it in a hot bath. Plain alum solution will not answer, because transferring the prints from it will overcharge the bath with alum.

Several prints may be toned in the hot bath together, or one immediately after the other, providing the bath is kept constantly hot.

The final alum bath is used to prevent blisters; it need not be used unless they occur.

The toning takes from ten minutes to half an hour in warm bath.

Standard Formula for Developing Papers.

One Ounce.

Tolidol	5 grains.	
Sulphite of Soda, dry	22 "	(or 45 gr. crys.)
Carbonate of soda, dry	15 "	(or 37 gr. crys.)
Water	1 ounce.	

Sixteen Ounces.

Tolidol	80 grains.	
Sulphite of Soda, dry	360 "	(or 720 gr. crys.)
Carbonate of soda, dry	240 "	(or 600 gr. crys.)
Water	16 ounces.	

Always add sufficient retarder to keep the whites on the prints clear for one minute. This will insure fine blue blacks, and more will change the color of the half-tones and shadows to green and brown.

Albumen Paper.

Toning Solution.

Chloride of gold	1 grain.
Acetate of sodium	30 grains.
Water	8 ounces.

Engraved by
Beck Engraving Co.,
Philadelphia

HARVEST TIME

By F. L. Fieger

This must not be used till one day after preparation. It keeps well and gives warm, rich tones.

Another.

Chloride of gold	1 grain.
Bicarbonate of sodium	4 grains.
Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

Another.

Chloride of gold	1 grain.
Phosphate of sodium	20 grains.
Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

Another.

Gold solution	10 drams.
Acetate of lime	20 grains.
Chloride of lime	1 grain
Tepid water	20 ounces.

The "gold solution" before mentioned is prepared by neutralizing as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

Another.

Chloride of gold	15 grains.
Water	5 ounces.

Neutralize with lime water, make up to fifteen ounces with water, and add two drams of chloride of calcium. This stock solution will keep for a long time. For use, dilute one ounce with ten ounces of water.

Combined Toning and Fixing Baths.

Hyposulphite of soda	3 ounces.
Nitrate of lead	60 grains.
Chloride of gold	6 "
Water	24 ounces.

Gaedicke.

Hyposulphite of soda	200	grams.
Boric acid	30	"
Lead nitrate	15	"
Sulphocyanide of ammonium	20	"
Chloride of gold, 1 : 200	60	c. c.
Water	1000	"

Another.

Chloride of gold	1 grain.
Phosphate of sodium	15 grains.
Sulphocyanide of ammonium	25 "
Hyposulphite of sodium	240 "
Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

No-Gold Combined Bath.

Hypo	6 ounces.
Washing soda	¼ ounce.
Lead acetate	½ "
Water	1 quart.

BLUE-PRINT FORMULAS.

No. 1.

Citrate of iron and ammonia	1⅞ ounces.
Water	8 "

No. 2.

Ferricyanide of potassium	1¼ ounces.
Water	8 "

Mix equal parts of No. 1 and No. 2, and apply with brush or by floating for three minutes. Plain Rives paper should be used; hang up to dry in darkened room.

Black Lines upon a White Ground.

Gelatine	3 drams.
Perchloride of iron solution (U. S. P.)	6 "
Tartaric acid	3 "
Ferric sulphate	3 "
Water	9 ounces.

Filter off any precipitate that may be found, and coat any good, stout, white paper with the full-strength solution. Expose in sunlight till details or lines are visible, and develop with

Gallic acid	6 drams.
Alcohol	6½ ounces.
Water	32 "

Wash well in several changes of water.

The sensitizing solution is as follows:

Gum arabic	15 grams.
Tartaric acid	2 "
Chloride of sodium (common salt)	9 "
Sulphate of iron	10 "
Iron perchloride	15 "
Water	110 c. c.

In mixing the solution, the gum arabic is first dissolved in the water by the aid of heat, and the other salts are added while the solution is still warm.

The solution is spread over the surface of the paper with a sponge, and, after allowing a little time for it to penetrate the surface, all superfluous moisture is removed, using the sponge again, well wrung out. If this precaution be not attended to, the depth of the lines is not equal. The paper is then dried as quickly as possible. If the drying is not rapid, the whites stain.

Exposure is somewhat longer than would be needed with sensitized albumenized paper. The color of the sensitized paper is yellow. During exposure all but the lines turn to white.

Development is by a plain aqueous solution of gallic acid, the strength of which is not important. Care must be taken not to leave the print too long in the developer, otherwise staining will result. After development the print is rapidly washed, when superfluous moisture is carefully sponged off the surface. If this precaution be not observed, inequality in the depth of the lines will result.

MOUNTANTS.

Best thin glue	3 ounces.
Golden syrup	¾ ounce.
Alcohol	3 ounces.
Water	3 "

Soften the glue in two ounces of the water; heat gently in a pan of hot water, add the syrup (refined molasses), add the other ounce of water to the alcohol, and pour into the jar under constant stirring.

Jarecki's.

A.

Wheat flour	3½ ounces.
Water	8 "

B.

Salicylic acid	15 grains.
Water	12 ounces.

Stir the flour with the eight ounces of water. Boil the other twelve, add the salicylic acid, and stir in A.

Non-Cockling Paste.

Nelson's No. 1 gelatine	4 ounces.
Glycerine	1 ounce
Alcohol	5 ounces.
Water	16 ounces.

Dissolve the gelatine in the water, add the glycerine, and then the alcohol.

MISCELLANEOUS FORMULAS.

COL. J. WATERHOUSE'S DEVELOPER FOR PRODUCING REVERSED NEGATIVES.

A.

Lithium carbonate sat. soda	1 ounce.
Eikonogen	5 grains.
Sodium sulphite	5 "

Dissolve the two latter in the first just before using it, and add a few drops of

B.

Ammonium bromide	1 part.
Thiocarbamide	3 parts.

Dissolve in water.

To Clean Negatives Stained by Silver.

Take a plug of cotton-wool and wet it well with a weak solution of cyanide of potassium; rub gently all over the negative, using a little more force on the stained parts. Wash well. Dry on blotting-paper. If necessary to revarnish, flood the plate once or twice with methylated spirit. Let dry, and then varnish in the ordinary way.

To Remove Yellow Stains Caused by Developer.

Sulphate of iron	3 ounces,	or	90 grams.
Sulphuric acid	1 ounce,	"	30 c. c.
Alum	1 "	"	30 "
Water	20 ounces,	"	600 "

If, after developing and fixing the negative, it is found to be stained yellow from the pyro or hydrochinone developer, first wash well to remove all hyposulphite, then immerse in above solution until the stain is removed; again wash well and dry.

To Remove Silver Stains from Negatives.

Iodine	5 grains.
Potassium iodide	20 "
Water	½ ounce.

When the iodine is dissolved, add, while stirring, a few drops of a strong solution of hypo until solution becomes colorless. Apply to the spot with the soft end of a finger or a tuft of absorbent cotton, rubbing gently. Rinse well and dry.

Soaking Solution for Films.

BLAIR.

Alcohol	4 ounces.
Glycerine	½ ounce.
Water	16 ounces.

Eastman.

Glycerine	1 ounce.
Water	32 ounces.

To Strip Film from Ordinary Plates.

Give negatives two coats of 2 per cent. collodion. The following formula yields good results:

Negative cotton	30 grains,	or	2 grams.
Ether	1 ounce, 6 drams,	"	50 c. c.
Alcohol	1 " 6 "	"	50 "

Allow the first coat to dry before applying the second, and, when second coating has set, place immediately in cold water until greasiness has disappeared, then place in a bath of

Sodium fluoride (com.)	5 drams,	or	20 grams.
Water	5 ounces,	"	160 c. c.

When thoroughly saturated with this solution, which will take at least an hour, place without washing in

Sulphuric acid	1 dram,	or	4 c. c.
Water	7 ounces,	"	196 "

Rubber trays should be used for this and the fluoride bath. When film begins to loosen, lay a piece of writing-paper or celluloid upon it as a support, and separate the two from the glass. After washing well under tap it can be transferred to a permanent support.

The following will answer the purpose: Coat a clean glass plate which has been rubbed with French chalk and dusted, with

Gelatine	2½ ounces,	or	75 grams.
Glycerine	3 drams,	"	10 c. c.
Water	16 ounces,	"	500 "

Filter before coating through Canton flannel, and avoid air bubbles. Coat on a leveling stand as thick as the plate will hold; allow to set and dry.

Clearing Solution.

Powdered alum	60 grains.
Sulphuric acid	60 minims.
Water	20 ounces.

A Substitute for Varnishing.

Alum	2 ounces.
Tannic acid	1 dram.
Water	16 ounces.

Immerse negative for from three to five minutes; too long an immersion will loosen the film. Films so treated are almost waterproof.

Varnish for Celluloid Films.

Powdered amber	5	parts.
Chloroform	45	"
Coal-tar benzine	45	"
Gum dammar	7½	"

The mixture should be allowed to stand in a warm place for some time, and should be decanted twice before using.

Ground Glass Varnish.

Sandarac	90	grains.
Mastic	20	"
Ether	2	ounces.
Benzole	½ to 1½	"

The proportion of the benzole added determines the grain of the matt obtained.

Retouching Varnishes.

Sandarac	1	ounce.
Castor oil	80	grains.
Alcohol	6	ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

Another.

Copaivic acid	¼	gram.
Dammar	½	"
Ether (strongest)	50	c. c.
Gasoline	120	"

Dry the dammar by heating until melted. When quite cold, powder, and dissolve in the ether. Then add the copaivic acid and finally add the mixture to the gasoline.

Another.

Gum dammar	1	part.
Oil of turpentine	5	parts.

Another.

Strong solution of gum myrrh in oil of turpentine.

Negative Varnishes.

Sandarac	4	ounces.
Alcohol	28	"
Oil of lavender	3	"

Another.

Bleached shellac	1¼	ounces.
Mastic	¼	ounce.
Oil of turpentine	¼	"
Sandarac	1¼	ounces.
Alcohol	20	fluid ounces.

Silvering Mirrors.

The glass plate to be silvered must be absolutely clean.

A.—Silver nitrate	175	grains.
Distilled water	10	ounces.
B.—Nitrate of ammonium	262	grains.
Distilled water	10	ounces.
C.—Pure caustic potash	1	ounce (avoir).
Distilled water	10	ounces.
D.—Pure sugar candy	½	ounce.
Distilled water	5	ounces.

Dissolve and add:

Tartaric acid	50	grains.

Boil in a flask for ten minutes, and, when cool, add:

Alcohol	1	ounce.
Distilled water to make	10	ounces.

For use, take equal parts of A and B. Mix together also equal parts of C and D, and mix in another graduate. Then mix both together in the silvering vessel, and suspend the mirror, face down, in the solution.

Coloring Photographs.

The finely powdered colors are mixed with the following:

Filtered albumen	100	c. c.
Ammonium carbonate	5	grains.
Glycerine	3	c. c.
Liquid ammonia	4	"
Water	25	"

Black for Woodwork.

Shellac	40	parts.
Borax	20	"
Glycerine	20	"
Water	500	"

After dissolving, add 50 parts aniline black.

For Writing on Glass.

Bleached shellac	2	parts.
Venice turpentine	1	part.
Oil of turpentine	3	parts.
Lampblack	1	part.

Warm the first three ingredients together over a water-bath, and then stir in the lampblack, incorporating thoroughly.

Printing on Silk.

Wash the silk in warm water, and float for two minutes on the following solution:

Salt	10 grains.
Ammonium chloride	10 "
Ammonia	15 drops.
Water	1 ounce.

Then hang the silk up to dry. Sensitize in

Silver nitrate	150 grains.
Water	1 ounce.

After floating on this for two minutes, dry, print deeply, and tone in ordinary manner.

Test for Hypo in Wash Water.

Permanganate of potash	3 grains.
Caustic soda	15 "
Water	16 ounces.

A few drops of the water to be tested is mixed with a few drops of this solution. If hypo is present, the red color will change to green.

Varnish for Plate-Holders and Camera Interiors.

Bleached shellac	5 ounces.
Borax	1 ounce.
Water	20 ounces.

Digest at nearly boiling point until dissolved; filter through muslin.

Another.

Shellac	4 ounces.
Borax	1 ounce.
Glycerine	½ "
Aniline black	2 ounces.
Water	20 "

Color Screen.

Saturated alcoholic solution of "brilliant yellow"	4 ounces.
Pyroxyline	40 grains.
Ether	4 ounces.

Comparative Strength of Various Lights.

Gas flame	1
Oxy-hydrogen light	11
Magnesium ribbon	58
Diffused daylight	268
Electric light	5179
Sunlight	16079

Engraved by
Art Engraving Co.,
St. Paul, Minn.

By A. G. McMichael

PORTRAIT STUDY

Process Formulas

Collodion.

Alcohol	8 ounces.
Ether	10 "
Cadmium iodide	52 grains.
Ammonium iodide	32 "
Strontium chloride	10 "
Calcium chloride	10 "
E. A. red label cotton	80 "

Developer.

Protosulphate of iron solution....................Hydrometer 20°.
Acetic acid ....1 ounce to 16 ounces of iron solution.
Alcohol................sufficient to make developer flow smoothly.

Intensifier.

Copper sulphate	1 ounce.
Potassium bromide	¼ "
Water	16 ounces.

Clearing solution, nitric acid 1, to 10 water. Black with silver nitrate solution, hydrometer 20°.

Copying Collodion for Line Work.

Ether and alcohol	Equal parts.
Anthony's snowy cotton	6 grains to 1 ounce.
Brown iodide of ammonium	4 " " "
Bromide of cadmium	1 grain " "

Enamel Solutions.

Clarified fish glue	1 ounce.
Pure gum arabic	1 "
Albumen	1 "
White rock candy	¼ "
Ammonium bichromate	½ "
Aqua ammonia	20 drops.
Water	6 ounces.

Another.

No. 1.

LePage's glue	3 ounces.
Albumen	1 ounce.
Ammonium bichromate	80 grains.
Water	4 ounces.

No. 2.

Gum acacia	½ ounce.
Aqua ammonia	¼ "
Water	8 ounces.

No. 2 solution will keep; No. 1 will not. For use, mix 3 ounces of No. 1 with 1 ounce of No. 2.

Another.

Fish glue	2 ounces.
White of egg	1 ounce.
Ammonium bichromate	60 grains.
Chromic acid	10 "
Liquid ammonia	¼ ounce.
Water	2 ounces.

Another.

Fish glue (Le Page's clarified)	1 ounce.
White of egg	1 "
Ammonium bichromate	30 grains.
Water	1 ounce.

Etching Solution.

Saturated solution common alum	40 ounces.
Nitric acid	1 ounce.

Albumen Sensitizing Solution.

White of two eggs (beat to froth with an egg-beater).	
Water	8 ounces.
Ammonium bichromate	30 grains.
Water	8 ounces.

Allow to stand over night, and filter before using.

FOR ETCHING ON STEEL.

Spencer Acid.

No. 1.

Nitric acid	5 ounces.
Water, distilled	5 "
Pure metallic silver	1 ounce.

No. 2.

Nitric acid, C. P.	5 ounces.
Water, distilled	5 "
Quicksilver	1 ounce.

The two solutions are made in separate vessels, and then mixed and kept in a glass-stoppered bottle. This mordant can be diluted with water, and thus the intensity of its action can be regulated. A strip of zinc, bent so as to touch a bared portion of the

steel at one end and the Spencer acid at the other, is used to establish a galvanic action and start the action of the acid.

ARTOTYPE FORMULAS.

Coat clean glass with

Albumen	150 grams.
Potassium bichromate	3 "

Dry in oven at 110° F. Lay face down on black velvet, and expose to light until albumen is insoluble. Coat with following:

Gelatine, soft	160 grams.
Ammonium bichromate	30 "
Water	2400 c. c.

Dry again at 110° F., and coat with:

A.

Gelatine	75 grams.
Water	1000 c. c.

B

Isinglass	75 grams.
Ammonium bichromate	18 "
Water	1000 c. c.

C.

Chrome alum	10 grams.
Potassium bicarbonate	2 "
Water	2000 c. c.

Mix A and B, and to each 100 c. c. add 2 c. c. of C. Flow and dry the plate as before. Expose in shade under negative for ten minutes. Immerse in water until colorless, wipe off with sponge, and print in a lithographic press.

A Substitute for Asphaltum.

Gum turmeric has been suggested as a substitute for asphaltum, the following being the formula:

Chinese turmeric	10 parts.
Alcohol	100 "
Oil of lavender	5 "
Methyl violet, saturated solution in alcohol	2 "

CARBUTT'S DEVELOPER FOR PROCESS PLATES.

Developing Formula for Half-Tone (Screen) and Negatives of Pen Drawings.

No. 1.

Neutral oxalate of potash	1 pound.
Warm water (free from lime salts)	48 ounces.

Add of a strong solution of citric acid enough to just turn litmus paper red.

No. 2.

Sulphate of iron	½	pound.
Sulphuric acid	15	drops.
Warm water	24	ounces.

No. 3.—*Restrainer.*

Potassium bromide	½	ounce.
Water	10	ounces.

To develop, to 5 ounces No. 1 add 1 ounce No. 2 and 10 drops No. 3.

To get an evenly developed plate, use sufficient developer to well cover the plate, allow to act until, on looking through, the image appears quite dense; then wash and place in clearing bath one or two minutes.

No. 4.—*Clearing Bath.*

Alum	1	ounce.
Citric acid	½	"
Water	20	ounces.

Again wash and immerse in fixing bath.

No. 5.—*Fixing Bath.*

Sulphite of soda	2	ounces.
Water	6	"
Sulphuric acid	1	dram.
Water	2	ounces
Hyposulphite of soda	1	pound.
Water	48	ounces.
Chrome alum	1	ounce.
Water	8	ounces.

Dissolve in the order given, add the solution of sulphuric acid to the sulphite of soda, add this to the hyposulphite, and finally add the solution of chrome alum.

No. 6.—*Reducing Solution.*

Ferricyanide of potassium	50	grains.
Water	10	ounces.

No. 7.—*Bleaching Solution.*

A.

Bichloride of mercury	240	grains.
Chloride of ammonium	240	"
Distilled water	20	ounces.

No. 7.—*Sulphite of Soda Solution.*

B.

Sulphite of soda	1	ounce.
Water	9	ounces.

Line Drawings from Photographs.

Sensitize Clemon's matt salted paper with a 40-grain-to-the-ounce bath of silver nitrate. Print under negative, and fix in hypo bath, 1 : 6. Wash well, mount, and draw on the print with waterproof India ink. Bleach out the photographic image with

Bichloride of mercury	1 ounce.
Water	5 ounces.

To Clean Glass.

Make up the following mixture:

Powdered pumice-stone	1 ounce.
Powdered chalk	1½ ounces.
Ammonia	½ ounce.
Water	1 "

Apply with a piece of wash leather, and polish with a piece of rag or soft paper.

Lemercier Lithographic Drawing-Ink.

Yellow wax	4 parts.
Tallow (mutton)	4 "
Marseilles soap	12 "
Shellac	6 "
Lampblack	1 part.

Boil together. Grind, when cold, with water. It should flow like writing-ink from the pen.

Lead Intensifier for Line Negatives.

After developing and washing, place the negative in a tray containing:

Red prussiate of potash	2 ounces.
Nitrate of lead	1¼ "
Water	24 "

Allow to remain until the film turns white, remove, and wash five minutes in running water, and blacken with:

Ammonium sulphuret	1 ounce.
Water	4 ounces.

Allow to act until it has penetrated the film, which is determined by examining back of plate; wash and clear with:

Nitric acid	1 dram.
Water	4 ounces.

Gelatine Solution for Stripping Film.

Sheet gelatine	1 ounce.
Glycerine	¼ "
Water	9 ounces.

Made in quantities to suit convenience.

Soak gelatine half an hour, and melt at a temperature of 110°; strain through double thickness of cheese-cloth. The negative to be coated must be placed on a three-point leveling stand; an extemporaneous one can be made by inserting in a bench or table three long screw-eyes, so placed as to form a triangle, placing a glass on them, and, by the aid of a small spirit-level, bring the surface to a true level.

PYRO DEVELOPER FOR STRIPPING PLATES.

Carbutt's.

No. 1.—*Pyro Stock Solution.*

Distilled ice water	10 ounces,	or 300 c. c.
Oxalic acid	1 dram,	" 4 "

Then add Schering's or Merck's Pyro, 1 ounce, or 30 grams, and water to make 16 fluid ounces, or 480 c. c.

No. 2.—*Soda Stock Solution.*

Soda sulphite, crystals	4 ounces,	or 120 grams.
Soda carb., crys. (or dry gran., 1 ounce)	2 "	" 60 "
Potash carbonate	1 ounce,	" 30 "
Water	10 ounces,	" 300 c. c.

Dissolve, and add water to make measure 16 fluid ounces, or 480 c. c.

No. 3.—*Bromide Solution.*

Bromide of sodium or potassium	½ ounce,	or 14 grams.
Water	5 ounces,	" 150 c. c.

To Develop.

Dilute 2 parts of stock No. 2 with 7 parts of water for cold weather, and 10 to 12 of water in summer. To three ounces of dilute No. 2 add 1½ to 2½ drams, or 6 to 10 c. c., of No. 1. The more pyro the denser the negative, and *vice versa.* No yellowing or fogging need be apprehended if directions are followed. Development should be continued until the image seems almost buried, then wash, and place in fixing bath.

N. B.—A few drops of bromide, say 8 to 12 drops, to the above is recommended.

For *instantaneous exposure,* take for a 5 x 8 or 6½ x8½ plate three ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drams of No. 1 into the graduate, and 2 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the

plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out this time, add to developer in pan three times its bulk of water, and let plate lie in it covered over half an hour or more if necessary, until full development is attained, then wash, and proceed as directed under head of developer.

Directions for Photographing a Blue-Print on Ross's Stipple Papers.

Make a bath of

Chrome alum	½ ounce.
Water	1 quart.

Pour into a tray large enough to accommodate your paper. Lay in the sheet perfectly flat, allow it to remain about three minutes, remove and hang up by the corners to dry. This makes the paper semi-waterproof, and it may be washed long enough for ordinary photo-prints.

To sensitize, coat the paper with the following solution:

Citrate of iron and ammonia	½ ounce.
Water	4 ounces.

using cotton to apply; then hang up in the dark-room to dry. Print under the negative until the darkest portion of the design appears, which is enough for an outline to follow in drawing.

Develop with:

Red prussiate of potash	10 grains.
Water	10 ounces.

Put in a tray and float about one-half minute until you see the design develop; wash well and dry.

Formula for Process Work suggested by G. Cramer Dry Plate Company.

One Ounce.

Tolidol (according to desired density)	2½ to 3½ grains.	
Sulphite of soda, dry	7½ grains	(or 15 gr. crys.)
Carbonate of soda, dry	10 "	(or 25 gr crys.)
Water	1 ounce.	

Sixteen Ounces.

Tolidol (according to desired density)	40 to 55 grains.	
Sulphite of soda, dry	120 grains	(or 240 gr. crys.)
Carbonate of soda, dry	160 "	(or 400 gr. crys.)
Water	16 ounces.	

Amateur Photographic Societies

UNITED STATES

AGASSIZ ASSOCIATION, MANHATTAN CHAPTER.—Established 1881. Headquarters, 141 East 40th Street, New York City. Annual meeting, first Friday in January. *President,* Rudolph P. Miller; *Vice-President,* Miss K. Hargrove; *Secretary,* Christian F. Groth; *Treasurer,* W. S. Miller.

ALBANY CAMERA CLUB, THE, ALBANY, N. Y.—Organized October 2. 1887—Incorporated 1891. Headquarters Club House, 72 Chapel Street. Annual meeting, first Friday in April. *President,* Chas. V. Winne; *Vice-President,* Robt. Shaw Oliver; *Secretary,* Chas. L. Palmer; *Treasurer,* T. L. Carroll.

AMATEUR PHOTOGRAPHIC ASSOCIATION, SELMA, ALA.—Established December 29, 1887. Headquarters, 916 Broad Street, Selma, Ala. Annual meeting, first Friday in January. Meet first and third Friday each month. *President,* William S. Monk; *Vice-President,* S. A. Sexton; *Secretary and Treasurer,* S. Orlando Trippe.

AMERICAN INSTITUTE PHOTOGRAPHICAL SECTION, NEW YORK CITY.—Established 1859. Headquarters, 111-115 West 38th Street. Annual meeting, first Thursday in February. *President,* Oscar G. Mason; *Vice-President,* Robert A. B. Dayton; *Secretary,* J. W. Bartlett, M. D., 149 West 94th Street; *Treasurer,* William H. Oakley.

AMERICAN LANTERN SLIDE INTERCHANGE.—Established 1885. Headquarters, 361 Broadway, N. Y. Annual meeting, November 15 of each year. *General Manager,* F. C. Beach. *Board of Managers,* F. C. Beach, W. H. Rau, Geo. Timmins, W. H. Cheny, John S. Paterson.

BALTIMORE CAMERA CLUB OF THE WEST BRANCH Y. M. C. A. —Established 1899. Headquarters, Baltimore, Md. *President,* Bryan Nicholson; *Vice-President,* Wm. N. Hazen; *Secretary and Treasurer,* Chas. E. Adams.

BINGHAMTON Y. M. C. A. CAMERA CLUB.—Established 1899. Headquarters, Binghamton, N. Y. *President,* Albert B. Brown; *Vice-President,* Arthur B. Hollister; *Secretary,* H. C. Price; *Treasurer,* E. F. Robinson.

BOSTON CAMERA CLUB.—Established 1881. Headquarters, 50 Bromfield Street, Boston, Mass. Annual meeting first Monday in January. *President,* Joseph Prince Loud; *Vice-Presidents,* Wm. O. Witherell, Chas. H. Currier, Chas. Sprague; *Secretary,* Chas. Hall Perry; *Treasurer,* Charles H. Chandler.

BRISTOL CAMERA CLUB.—Established January, 1899. Headquarters, Bristol, Pa. *President,* Llewelyn Davis; *Vice-President,* Jesse O. Thomas, Jr.; *Secretary,* Edgar A. Smith; *Treasurer,* Philip J. Blackwood.

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BROCKTON CAMERA CLUB, BROCKTON, MASS.—Established April 9, 1894. Headquarters, Room 1, Smith Building. Annual meeting, third Friday in April. *President,* A. D. Evans; *Vice-President,* Geo. W. Loring; *Secretary,* A. E. Carpenter, 37 Manomet Street; *Treasurer,* W. C. Spring. The Photo-Pyrotechnics, the official organ of the club, is published monthly.

BROOKLYN ACADEMY OF PHOTOGRAPHY.—Established February, 1887. Headquarters, 177 Montague Street, Brooklyn. Annual meeting, first Tuesday in June. *President,* Wm. Arnold; *First Vice-President,* Sherman Esselsteyn; *Second Vice-President,* Dr. S. B. Price; *Secretary,* H. M. Valentine; *Treasurer,* W. T. Wintringham.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES, DEPARTMENT OF PHOTOGRAPHY OF THE.—Headquarters, 201 Montague Street, Brooklyn, N. Y. Annual meeting, April. *President,* Prof. Chas. H. Morse; *Vice-President,* W. J. Bryant; *Secretary,* A. C. Ruprecht; *Treasurer,* John H. Norris.

CALIFORNIA CAMERA CLUB.—Established April 5, 1890. Headquarters, Academy of Sciences Building, San Francisco. Annual meeting, first Tuesday after first Monday in April. *President,* J. W. Erwin; *Vice-Presidents,* E. J. Dollard, W. B. Webster; *Secretary,* H. B. Hosmer; *Treasurer,* E. G. Eisen.

"CAMERADS," NEW BRUNSWICK, N. J.—*Secretary,* Harvey Iredell, D.D S.; *Treasurer,* Chas, V. Myers.

CAPITAL CAMERA CLUB OF WASHINGTON, D. C.—Organized May, 1891. Headquarters, 1010 F Street, N. W., Walter Building. Annual meeting, first Saturday in May. *President,* George W. White; *Vice-President,* Wallace C. Babcock; *Secretary,* W. F. Peabody; *Treasurer,* Wm. P. Herbst.

CAPITAL CITY CAMERA CLUB, THE.—Established 1899. Headquarters, Salem, Ore. *President,* A. E. Strang; *Vice-President,* R. H. Leabo; *Secretary,* Mrs. W. E. Copeland; *Treasurer,* Miss Fannie Kehne.

CENTRAL CAMERA CLUB OF THE YOUNG MEN'S CHRISTIAN ASSOCIATION, BROOKLYN, N. Y.—Established January, 1888. Headquarters, 502 Fulton Street, Brooklyn, N. Y. Annual meeting, first Monday in January. *President,* Wm. H. Lowery; *Vice-President,* James P. Allen; *Secretary,* Edwd. L. Damon; *Treasurer,* Chas. Kirhn.

CHATTANOOGA CAMERA CLUB.—Established December 12th, 1898. Headquarters, Chattanooga, Tenn. *President,* M. L. Mudge; *Secretary and Treasurer,* Emil B. Igou.

CHAUTAUQUA PHOTOGRAPHIC EXCHANGE CLUB.—Established 1888. (Correspondence.) *President,* C. M. Fitzgerald, of California; *Secretary and Treasurer,* Mrs. C. L. Pierce, "Elmhurst," Riverside, Conn.

CHICAGO SOCIETY OF AMATEUR PHOTOGRAPHERS.—Established 1886. Incorporated July, 1894. Headquarters, The Art Institute. Annual meeting, second Wednesday in January. *President,* T. Geo. Hislop; *Vice-President,* E. M. Murray; *Secretary,* E. W. Grievish; *Treasurer,* Geo. H. Kittoe.

COLUMBIAN AMATEUR PHOTO EXCHANGE.—Established 1893 *President,* A. H. Waite; *Secretary,* W. E. Dickinson, Osage, Iowa.

COLUMBIA PHOTOGRAPHIC SOCIETY.—Established December 7, 1889. Headquarters, 1811 North Broad Street, Philadelphia, Pa. Annual meeting, first Monday in February. *President,* G. J. R. Miller, D.D.S.; *First Vice-President,* Percival A. Mitchell; *Second Vice-President,* Frank E. Gartley; *Secretary,* E. Ford Cuming; *Treasurer,* John P. Kolb.

CORLISS ART AND CAMERA CLUB.—Established 1896. Headquarters, corner State and Harris Streets. Annual meeting, first Friday in April. *President,* C. L. B. Anderson; *Vice-President,* Otis P. Gould; *Secretary.* Edgar F. Noyes; *Corresponding Secretary,* John H. Wheeler; *Treasurer,* Edgar F. Noyes.

CORYDON CAMERA CLUB.—Established 1899. Headquarters, Corydon, Ind. *Captain,* Hugh O'Connor; *Vice-Captain,* S. D. Bartley; *Secretary,* Miss Clem Mathes; *Treasurer,* John Trotter.

DAGUERRE CAMERA CLUB.—Established 1893. Headquarters, members' houses. Annual meeting, December 19, 1899. *President,* C. B. Witbeck; *Vice-President,* Wm. A. Wilson; *Secretary,* J. W. Flynn, M. D., 116 East 81st Street, N. Y. C.; *Treasurer,* Carl Stulpnagel.

DETROIT CAMERA CLUB.—Established February 11, 1897. Headquarters, Van Husan Building, 106 Miami Avenue. Annual meeting, first Tuesday in June. *President,* E. Donald Roberts; *Vice-President,* E. W. Sprague; *Secretary-Treasurer,* W. E. Winckler.

DULUTH Y. M. C. A. CAMERA CLUB.—Established June, 1898. Headquarters, Y. M. C. A., Duluth, Minn. Address, B. A. Shuman, Secretary Y. M. C. A.

EAST ORANGE CAMERA CLUB.—Established April 4, 1899. Headquarters, East Orange, N. J. *President,* D. L. Gorsline; *Vice-President,* W. H. Mason; *Secretary,* W. H. Craig; *Treasurer,* C. K. Foiles.

ELIZABETH CAMERA CLUB.—Established May, 1893. Headquarters, 96 Broad Street. Annual meeting, first Saturday in May. *President,* H. O Halsey; *Vice-President,* W. C. Wells; *Secretary,* J. H. Walker; *Treasurer,* W. R. Bird.

ERIE CAMERA CLUB, ERIE, PA.—Established, May 29, 1894. Headquarters, Room 30, Dowing Building. Annual meeting, third Thursday of January. *President,* Frank W. Grant; *Vice-President,* Jos. M. Force; *Secretary,* B. P. Beckers; *Treasurer,* Robert Smith.

GENESEE CAMERA CLUB.—Established 1899. Headquarters, Genesee. N. Y. *President,* W. E. B. De Vine; *Secretary,* Owen Scott; *Treasurer,* B. Howarth.

HARTFORD SCIENTIFIC SOCIETY.—Established and incorporated 1885. Headquarters, Hartford, Conn. Annual meeting, October. *President,* Geo. L. Parmele; *Secretary,* Edw. C. Swan; *Treasurer,* Albert C. Bates. PHOTOGRAPHIC SECTION.—C. R. Nason, *Chairman;* Margaret H. Olmstead, *Secretary.*

HAVERHILL CAMERA CLUB.—Established February 8, 1898. Headquarters, Rooms 44 and 45, Daggett Building. Annual meeting, second Tuesday of June. *President,* Charles W. Glines; *Vice-President,* George E. Dodge; *Secretary and Treasurer,* Alfred E. Collins; *Executive Committee,* Wm. H. Burke, E. H. Lufkin and officers.

ILLINOIS COLLEGE OF PHOTOGRAPHY, EFFINGHAM, ILL.—Established 1894. *President,* L. H. Bissell; *Secretary,* Aurora L. Buckner.

INTERNATIONAL PHOTO PRINT EXCHANGE.—Established May, 1893. Headquarters, Beach Bluff, Mass. A postal photographic exchange club limited to twenty members. *Secretary and Treasurer,* Walter Sprange.

JERSEY CITY CAMERA CLUB.—Established 1898. Headquarters, Jersey City. *President,* Eugene Sutherland; *Vice-President,* Rev. R. M. Aylesworth; *Secretary,* H. Jacobson; *Treasurer,* William Dilts.

JERSEY CITY Y. M. C. A. CAMERA CLUB.—Established 1899. Headquarters, Jersey City, N. J. *President,* J. Mills Dilloway; *Secretary,* R. Anderson.

LANCASTER CAMERA CLUB.—Established May 15, 1895. Headquarters, Morning News Building, Penn Square. Annual meeting. first Thursday in May. *President,* W. S. Glein; *Vice-President,* W. A. Heitshu; *Secretary and Treasurer,* Chas. A. Sauber.

LANCASTER Y. M. C. A. CAMERA CLUB.—Established May 4, 1898. Headquarters, Y. M. C. A. Building. Annual meeting, April, second Tuesday. *President,* John M. Ziegler; *Vice-President,* Aaron Stauffer; *Secretary,* John S. Cochran; *Treasurer,* John Eichler.

LOWELL CAMERA CLUB, LOWELL, MASS.—Established 1889. Incorporated 1892. Headquarters, Central Block. Annual meeting, first Tuesday in March. *President,* Paul Butler; *Vice-Presidents,* W. P. Atwood, F. T. Walsh; *Secretary,* George A. Nelson, 305 Summer Street; *Treasurer,* M. A Taylor.

MALDEN Y. M. C. A. CAMERA CLUB, MALDEN, MASS.—Established January 16, 1895. Headquarters, Y. M. C. A. Building. Annual meeting, first Wednesday in January of each year. *President,* J. Arthur Came; *Vice-President,* F. G. Stetson; *Secretary,* Ashley M. Hoyt.

MATTAPAN CAMERA CLUB.—Established May, 1890. Headquarters, secretary's studio, Brush Hill Road, Mattapan. Annual meeting, month of May. *President,* John N. Locklin; *Vice-President,* Walter Hertzberg; *Secretary,* Erdmann Sonnenbrodt; *Treasurer,* Walter Hertzberg.

MEADVILLE CAMERA CLUB.—Established 1899. Headquarters, Meadville, Pa. *President,* Dr. J. H. Montgomery; *Vice-President,* Rev. A. C. Bowers; *Secretary,* Chas. F. Clyde; *Treasurer,* Mrs. A. L. Ballinger.

METTOWEE AMATEUR PHOTOGRAPHIC CLUB.—Established January, 1899. Headquarters, Granville, N. Y. *President,* F. V. Ives; *Vice-President,* Mrs. Potter; *Secretary,* Daniel Edwards; *Treasurer,* Miss Maddock.

MINNEAPOLIS CAMERA CLUB.—Established 1892. Annual meeting, April. *President,* H. E. Murdock; *Vice-President,* W. H. McMullen; *Secretary,* C. J. Hibbard, 317 Hennepin Avenue; *Treasurer,* John F. Schlimme.

MOBILE CAMERA CLUB, MOBILE, ALA.—Established March 1, 1898. Headquarters, Art League rooms. Annual meeting, second Friday in January. *President,* Hugh Rolston; *Vice-President,* Chas. S. Shawhan; *Secretary and Treasurer,* Richard Hines, Jr.

MYSTIC CAMERA CLUB, MEDFORD, MASS.—Established June 4, 1889. Headquarters, 4 Ashland Street. Annual meeting, first Tuesday in January. *President,* Will C. Eddy; *Vice-President,* L. E. Shattuck; *Secretary,* Geo. W. Prowse; *Treasurer,* C. A. Clarke.

NORFOLK CAMERA CLUB.—Established 1898. Headquarters, Main and Church Streets, Norfolk, Va. *President,* Dr. Randall Barett; *Vice-President,* W. H. Taylor, Jr.; *Secretary,* C. R. Mackimmie; *Treasurer,* H. N. White.

NEW HAVEN PHOTOGRAPHIC SOCIETY.—Established 1899. Headquarters, New Haven, Conn. *President,* Dr. W. G. Alling; *Vice-President,* J. R. McCusker; *Secretary,* M. C. Ferguson; *Treasurer,* F. J. Chatterton.

OHIO AMATEURS' ASSOCIATION.—Established November 25, 1898 Headquarters, Fostoria, O. *President,* Clarence H. White; *Vice-President,* E. A. Mergenthaler; *Secretary,* Miss Emma Spencer; *Treasurer,* Andrew Emerine, Jr.

OLD COLONY CAMERA CLUB, ROCKLAND, MASS.—Established 1890. Headquarters, Arnold Building. Annual meeting, first Saturday in January. *President,* David Smith; *Vice-President,* Emery H. Jenkins; *Secretary,* David Smith; *Treasurer,* Emery H. Jenkins.

ONEIDA CAMERA CLUB.—Established March 24, 1894. Headquarters, Post Office Block. Annual meeting, first Tuesday in April. *President,* B. S. Teale; *Vice-President,* E. R. McDougall; *Secretary and Treasurer,* Albert Dygert.

ORANGE CAMERA CLUB, ORANGE, N. J.—Established March 20, 1892. Headquarters, 222 Main Street, Orange, N. J. Annual meeting, March 20. *President,* F. H. Gould; *Vice-President,* D. S. Plumb; *Secretary,* W. H. Mason; *Treasurer,* E. S. Butterfield.

OREGON CAMERA CLUB, PORTLAND, OREGON.—Established January 14, 1895. Headquarters, Oregonian Building, Portland, Oregon. Annual meeting, second Tuesday in January. *President,* Will. H. Walker; *Vice-President,* Frank C. Cover; *Secretary,* Milton P. Goldsmith; *Treasurer,* Fred. A. French. Membership August 1, active, 120.

PAWTUCKET YOUNG MEN'S CHRISTIAN ASSOCIATION CAMERA CLUB.—Established May, 1898. Headquarters, Pawtucket Y. M. C. A. Annual meeting, May each year. *President,* J. Henry Weaver; *Vice-President,* S. H. Byron; *Secretary and Treasurer,* Geo. A. Harrington.

PHOTOGRAPHIC SOCIETY OF PHILADELPHIA.—Established November, 1862. Headquarters, 10 S. 18th Street. Annual meeting, April, second Wednesday. *President,* Robert S. Redfield; *Vice-President,* George Vaux, Jr., and Walter P. Stokes; *Secretary,* Edmund Stirling; *Treasurer,* Anthony W. Robinson.

PIKE CAMERA CLUB.—Established 1899. Headquarters, Merrimac, Mass. *President,* Rev. H. A. Cornell; *Vice-President,* Chas. Howe; *Treasurer,* Byron Sargent.

PITTSBURG AMATEUR PHOTOGRAPHERS' SOCIETY. — Established 1885. Headquarters, Carnegie Library. Annual meeting, January, second Monday. *President,* E. E. Keller; *Vice-President,* H. L. Christy; *Secretary,* Joseph H. Hunter; *Treasurer,* W. J. Hunker.

PITTSFIELD CAMERA CLUB, PITTSFIELD, MASS.—Established 1892. Meetings held at residence of members. Annual meeting, February. *President,* J. F. Middleton; *Vice-President,* J. D. Roscoe; *Secretary,* J. E. Colton; *Treasurer,* J. H. Musgrove.

PLAINFIELD CAMERA CLUB, PLAINFIELD, CONN.—Headquarters, Babcock Building. Annual meeting, December. *President,* H. H. Coward; *Vice-President,* Louis Borsum; *Secretary,* J. Hervey Doane, 115 Park Avenue; *Treasurer,* H. W. Marshall.

PORTLAND CAMERA CLUB.—Established 1899. Headquarters, Portland, Me. *President,* George F. Gould; *Vice-President,* N. W. Edson; *Secretary,* Edgar R. Dow; *Treasurer,* J. H. Lamson.

PORTSMOUTH CAMERA CLUB, PORTSMOUTH, VA.—Established 1897. Headquarters, 614 Crawford Street. Annual meeting, May 1. *President,* Jesse P. Neville; *Secretary and Treasurer,* H. F. Richardson.

POSTAL PHOTOGRAPHIC CLUB.—Organized 1885. *President,* Albert J. LeBreton, Washington; *Secretary and Treasurer,* F. O. Congdon, 120 Broadway, New York. Membership, 40, composed of amateur photographers in different cities, who each month contribute prints to an album for circulation among the members, together with a note-book for criticisms and comments.

PROVIDENCE CAMERA CLUB.—Established 1883. Incorporated 1889. Headquarters, 174 Weybosset Street, Providence, R. I. Annual meeting, second Wednesday in June. *President,* Fred. P. Wilbur; *Vice-President,* W. Penn Mather; *Recording Secretary,* A. F. Manchester; *Corresponding Secretary,* Christopher M. Lee, 147 Elmwood Avenue, Providence, R. I.; *Treasurer,* Edmund A. Darling.

PROVIDENCE Y. M. C. A. CAMERA CLUB.—Established April, 1896. Headquarters, 519 Westminster Street, Providence, R. I. Annual meeting, April. *Président,* C. Abbott Davis; *Secretary,* C. B. F. Davis; *Treasurer,* Heman L. Calder.

READING Y. M. C. A. CAMERA CLUB.—Established 1899. Headquarters, Reading, Pa. *President,* Otis Wanner; *Secretary,* John J. Strickland: *Treasurer,* O. J. Leiby.

ROCKLAND CAMERA CLUB OF THE Y. M. C. A.—*President,* Eugene F. Perry; *Vice-President,* Jas. P. Blauvelt; *Secretary and Treasurer,* Herbert R. Marshall.

ROCKVILLE CAMERA CLUB.—Established 1899. Headquarters, Rockville, Conn. *President,* T. S. Pratt; *Vice-President,* E. F. Badmington; *Secretary,* C. F. Gubitz; *Treasurer,* F. H. Holt.

RUTLAND CAMERA CLUB, RUTLAND, VT.—Established October, 1893. Annual meeting, second Tuesday in October. *President,* Cornele G. Ross; *Secretary and Treasurer,* V. F. Worcester.

SACRAMENTO CAMERA CLUB, SACRAMENTO, CAL.—Established June 4, 1895. Headquarters, 504 J Street. Annual meeting, June 4. *President,* Capt. Thos. B. Hall; *Vice-President,* Ferdinand Kohler; *Secretary,* W. G. Woods, 420 J Street; *Treasurer,* R. P. Burr.

SAVANNAH CAMERA CLUB.—Established June, 1897. Headquarters, Bull Street and Park Avenue. Annual meeting, first Wednesday in May. *President,* B. J. Apple; *First Vice-President,* Alexis Nicolas; *Second Vice-President,* Paul M. Bryan; *Secretary and Treasurer,* C. Easton Yonge.

SPRINGFIELD CAMERA CLUB, SPRINGFIELD, MASS.—Established October 11, 1886. Headquarters, Y. M. C. A. Building, State and Dwight Streets. Annual meeting, third Wednesday in October. *President,* Bion D. Wheeler; *Secretary,* E. L. Pease; *Librarian,* F. W. Huntley. Membership, 82.

ST. LOUIS PHOTOGRAPHIC SOCIETY.—Established 1894. Headquarters, Century Building (temporary). Annual meeting, first Monday in December. *President,* Robert E. M. Bain; *Vice-President,* John B. Holman: *Secretary and Treasurer,* Charles M. Alexander.

ST. PAUL CAMERA CLUB.—Established April 19, 1899. Headquarters, 48 East Fourth Street, St. Paul, Minn. Annual meeting, second Tuesday of April. *President,* Wm. E. Johnson; *Vice-President,* W. J. Sonnen; *Secretary,* E. N. Easton; *Treasurer,* H. A. Clifford.

SUNNY SIDE CAMERA CLUB, ST. LOUIS, MO.—Organized October 10, 1891. Headquarters, third floor of 5900 South Broadway. Annual meeting, October 10. *President,* Berthold W. Blumenthal; *Vice-President,* Edmund Broch; *Secretary and Treasurer,* Wm. Britchner.

SYRACUSE CAMERA CLUB.—Established 1886. Headquarters, University Block. Annual meeting, first Friday in January. *President,* H. B. Buell; *Vice-President,* J. I. H. Wright; *Secretary,* Dan H. Sweet; *Treasurer,* J. E. Bierhardt.

TACOMA CAMERA CLUB.—Established February or March, 1899. Headquarters, Tacoma, Wash. *President,* Arthur G. Prichard; *Vice-President,* Mrs. M. W. Graff; *Secretary,* Mrs. J. H. Scott; *Treasurer,* Frank G. Taylor.

THE CAMERA CLUB OF NEW YORK.—Incorporated May 7, 1896. Headquarters, 3 West 29th Street. Annual meeting, second Tuesday of April. *President,* Wm. D. Murphy; *Vice-President,* Alfred Stieglitz; *Secretary,* Harry B. Reid; *Treasurer,* Wm. E. Wilmerding.

TOLEDO Y. M. C. A. CAMERA CLUB.—Established 1899. Headquarters, Toledo, O. *President,* Wesley Wuerfel; *Vice-President,* W. R. Moffat; *Secretary and Treasurer,* John Powell.

TOPEKA CAMERA CLUB.—Established September 5, 1894. Annual meeting, second Tuesday in January. *President,* F. M. Tuckerman; *Vice-President,* R. H. Gaw; *Secretary,* F. M. Tuckerman; *Treasurer,* W. E. Culver.

TRENTON PHOTOGRAPHIC SOCIETY.—Established January, 1898. Headquarters, Rooms 11 and 12 Scott Building, Trenton, N. J. Annual meeting, first Monday in February. *President,* William C. Lawrence; *Vice-President,* Harry G. Aitken; *Secretary,* Grant Castner, 51 Bayard Street; *Treasurer,* Harry V. Holden.

UTICA CAMERA CLUB.—Established February 3, 1899. Headquarters, Utica, N. Y. *President,* D. Vaughn Ely; *Vice-President,* H. H. Wells; *Secretary and Treasurer,* M. C. Brown.

VALLEY CAMERA CLUB.—Established November 18, 1896. Headquarters, Phenix, R. I. Annual meeting, first Monday in April. *President,* Ward E. Smith; *Secretary,* J. Bancroft Lawton; *Treasurer,* F. J. Hoxie.

THE WEBSTER CAMERA CLUB.—Established 1899. Headquarters, Webster Grove, Mo. *President,* W. A. Sisson; *Vice-President,* F. C. Thompson; *Secretary and Treasurer,* A. K. Prince.

UNITED KINGDOM

AINTREE PHOTOGRAPHIC SOCIETY.—Established March, 1894. Headquarters, Aintree Institute. Annual meeting, March 13. *President,* Wm. Lockier; *Vice-Presidents,* D. J. Neill and W. H. Lloyd; *Secretary,* J. Herbert Righy, "Elton," Aintree, England.

ASHTON-UNDER-LYNE PHOTOGRAPHIC SOCIETY.—Established 1891. Headquarters, 10 Henry Square, Ashton-under-Lyne, England. Annual meeting, third Thursday in March. *President,* Dr. Alex. Hamilton; *Vice-Presidents,* Major Bradley, Thos. Glazebrook, Chas. E. Redfern, J.P., Abel Buckley, J.P., John W. Kenworthy, J.P., John Wilson, J.P., Tulloch Cheyne, Chas. Lord; *Secretary,* Robt. T. Marsland, 24 Park Parade, Ashton-under-Lyne; *Treasurer,* Walter Leigh, 200 Oldham Road; *Librarian,* Sam. A. Platt, 4 Cowhill Lane.

BATH PHOTOGRAPHIC SOCIETY, ENGLAND.—Established 1888. Headquarters, Royal Literary and Scientific Institution. Annual meeting, last Wednesday in February. *President,* George Norman, Esq.; *Vice-President,* E. J. Appleby; *Secretary and Treasurer,* W. Middleton Ashman.

BIRMINGHAM NATURAL HISTORY AND PHILOSOPHICAL SOCIETY, BIRMINGHAM, ENGLAND.—Established 1858. Headquarters, Norwich Union Chambers, Congreve Street. Annual meeting, February. *President,* R. W. Chase, M.B.O.U.; *Vice-President,* Prof. T. W. Bridge, M.A., D.Sc., and Prof. J. H. Poynting, M.A., D.Sc., F.R.S.; *Secretary,* W. P. Marshall, M.I.C.E., and P. L. Gray, B.Sc.; *Treasurer,* C. A. Harrison.

BIRMINGHAM PHOTOGRAPHIC SOCIETY. — Established 1885. Headquarters, Athletic Institute, John Bright Street, Birmingham, England. Annual meeting, January. *President,* Prof. F. J. Allen; *Vice-Presidents,* G. F. Lyndon, J.P., E. Underwood, J. F. Hall Edwards, L.R.C.P., T. W. Robinson; *Secretary,* C. J. Fowler, Court Mount, Erdington; *Treasurer,* R. Haines.

BLAIRGOWRIE AND DISTRICT PHOTOGRAPHIC ASSOCIATION. —Established February 13, 1894. Headquarters, George Street, Blairgowrie, Scotland. Annual meeting, third Tuesday in February. *President,* Alex. Geekie; *Vice-Presidents,* J. B. Maclacklan and T. C. Gorrie; *Secretary,* Hugh B. Jamieson; *Treasurer,* David G. Monair.

BRADFORD PHOTOGRAPHIC SOCIETY.—Established 1894. Headquarters, the Bradford Grammar School. Annual meeting, third Monday in January. *President,* Percy Lund; *Secretary,* Ezra Clough; *Treasurer,* David Stevenson.

BRECHIN PHOTOGRAPHIC ASSOCIATION. — Established 1888. Headquarters, Y. M. C. A. Institute. Annual meeting, third Wednesday in September. *President,* Wm. Shaw Adamson, Carlston Castle; *Vice-Presidents,* R. W. Duke and J. D. Ross; *Secretary,* Alexander Watson, 75 River Street, Brechin, Scotland; *Treasurer,* John E. Small.

BRISTOL AND WEST OF ENGLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.—Headquarters, Literary and Philosophic Club, Berkeley Square. Annual meeting, January. *President,* H. A. Hood Daniel; *Vice-Presidents,* Edward Bryktman and Dr. Ormerod; *Secretaries,* Edward Bryktman, Lyndale, Redland Road, Bristol, and Martin Lavington; *Treasurer,* William Moline.

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A CONVENTION PRIZE WINNER, P. A. OF A.,
1899

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—Established 1831. Headquarters, office Burlington House, London. Annual meeting, Dover, September 13-20. *President,* Dr. Michael Foster; *Secretary,* G. Griffith; *Treasurer,* Prof. Carey Foster.

BURY PHOTOGRAPHIC AND ART CLUB.—Established 1882. Headquarters, 12 Market Street, Bury, England. Annual meeting, fourth Wednesday in September. *President,* Roger Wood, Esq.; *Vice-President,* T. M. Barbour, Esq.; *Secretary,* A. E. Riding; *Treasurer,* J. Nicholls.

CAMERA SECTION WORCESTER TRICYCLE CLUB.—Established 1892. Headquarters, Bell Hotel, Worcester, England. Annual meeting, January. *President,* James Wilkes, Esq.; *Secretary,* T. J. Hobson, 15 Albany Terrace, Worcester; *Treasurer,* F. E. Hill.

CARDIFF PHOTOGRAPHIC SOCIETY.—Established 1886. Headquarters, 7 and 8 Working Street, Cardiff, England. Annual meeting, November 10, 1899. *President,* W. J. Jenkins; *Vice-Presidents,* S. W. Allen, G. Bedford, W. H. Kitchen; *Joint Secretaries,* L. Ernest Hopkins and J. Blount Hopkins; *Treasurer,* Wm. Booth.

CITY AND GUILDS OF LONDON TECHNICAL COLLEGE FINSBURY PHOTOGRAPHIC SOCIETY.—Established 1887 Headquarters, City and Guilds of London Technical College, Leonard Street, City Road, London, E. C. Annual meeting, October. *President,* R. Meldola, F.R.S., F.I.C., F.C.S.; *Vice-Presidents,* J. Castell Evans, F.I.C. and F. L. Streatfeild, F.I.C.; *Secretaries,* L. A. Williams and J. F. M. Roberts; Treasurer, T. H. Norris, F.I.C.

CLYDESDALE CAMERA CLUB.—Established 1889. Headquarters, Wemyss Bay, Scotland. *President,* H. E. Gordon, Esq.; *Secretary and Treasurer,* Hon. A. Caroline Burns.

COLNE CAMERA CLUB.—Headquarters, Cloth Hall, Colne, Lancaster, England. *President,* Rev. T. Leyland; *Vice-Presidents,* H. Hewitt, J. Duckworth, Jos. Hay; *Secretary,* R. T. Lawson, 34 Skipton Road; *Treasurer,* Joshua Robinson.

CORNISH CAMERA CLUB. — Established 1888. Headquarters, The Studio, Penzance, Cornwall, England. Annual meeting, May *President,* W. E. Bailey, C.C., F.L.S.; *Vice-President,* R. Pearce Couch; *Secretary,* H. Tonkin, 22 Market Place, Penzance, Cornwall, England; *Treasurer,* A. R. F. Evershed, M.R.C.S.

CROYDON MICROSCOPICAL AND NATURAL HISTORY CLUB, PHOTOGRAPHIC SECTION.—Established 1870. Headquarters, Public Hall, George Street, Croydon, Surrey, England. Annual meeting, January 17, 1899. *President,* I. M. Hobson, M.D., B.Sc.; *Vice-President,* W. Murton Holmes; *Secretary,* Harry D. Gower, 55 Benson Road, Croydon, Surrey; *Treasurer,* F. J. Townsend.

DERBY PHOTOGRAPHIC SOCIETY.—Established May, 1884. Headquarters, Y. M. C. A. Inst., Derby, England. Annual meeting, third Tuesday in January. *President,* Capt. W. de W. Abney, C.B., D.C.L., F.R.S.; *Vice-President,* Thos. A. Scotton; *Secretary,* Edmd. Fearn; *Treasurer,* F. H. Gandy.

DEVONPORT CAMERA CLUB.—Established 1891. Headquarters, Odd Fellows' Hall, Ker Street, Devonport, England. Annual meeting, September. *President,* R. E. J. Lamb, Esq.; *Vice-Presidents,* Coombes, Dart, Dymond, Turney; *Secretary,* Wm. H. Lamb; *Treasurer,* C. Croydon, Esq.

DUKINFIELD PHOTOGRAPHIC SOCIETY.—Established 1888. Headquarters, Co-operative Hall, Astley Street, Dukinfield, England. Annual meeting, Wednesday, January 17, 1899. *President,* T. H. Gordon, Esq., B.A., C.C.; *Vice-Presidents,* S. T. Ainsworth, Esq., J. W. Hadfield, Esq., J. T. Lees, Esq.; *Secretary,* W. D. Roberts, 24 Chapel Street, Dukinfield; *Treasurer,* J. Winterbottom, Alderdale Terrace, Chapel Street, Dukinfield.

"DUNDEE ADVERTISER" PHOTOGRAPHIC CLUB.—Established 1894. Headquarters, Advertiser Office, Dundee, Scotland. Annual meeting, second Tuesday of October. *President,* Mr. J. A. Mackenzie; *Vice-President,* Mr. J. L. Scott; *Secretary and Treasurer,* Archd. Campbell, Stewart Terrace, Barnhill, Broughty Ferry, Scotland.

DUNDEE AND EAST OF SCOTLAND PHOTOGRAPHIC ASSOCIATION.—Established 1879. Headquarters, 39 High Street, Dundee, Scotland. Annual meeting, second Thursday of October. *President,* Prof. Steggall; *Vice-Presidents,* W. F. Hill and W. H. Tittensor; *Secretary and Treasurer,* V. C. Baird, Broughty Ferry, N. B.

DUNEDIN PHOTOGRAPHIC SOCIETY.—Established 1890. Headquarters, Dunedin, Scotland. *President,* C. W. Kerr; *Vice-Presidents,* A. Hamilton and R. A. Ewing; *Secretary,* I. S. Kottowe Webb, care of National Insurance Co., Dunedin; *Recording Secretary,* W. Livingston; *Treasurer,* I. S. Kottowe Webb.

DURHAM CITY CAMERA CLUB.—Established January, 1892. Headquarters, Shakespeare Hall, Durham, England. Annual meeting, February. *President,* Captain E. White; *Vice-Presidents,* E. J. Meynell and R. Moult; *Secretary,* Robert Hanawell; *Treasurer,* The Mayor of Durham (W. Gray, Esq.).

EASTBOURNE PHOTOGRAPHIC SOCIETY. — Established 1892. Headquarters, Caldecott Museum Building, Lismore Road, Eastbourne, England. Annual meeting, first week in January. *President,* Henry Habgood, M.D.; *Vice-Presidents,* H. P. Molineux and H. M. Whitley; *Secretary and Treasurer,* John J. Hollway.

EDINBURGH PHOTOGRAPHIC SOCIETY.—Established 1861. Headquarters, 38 Castle Street, Edinburgh, Scotland. Annual meeting, first Wednesday in June. *President,* Alex. Eddington, F.J.I.; *Vice-Presidents,* James Hay and H. Scott Lander, Dep. Insp. Gen., R. N.; *Secretary,* J. S. McCulloch, W. S,, 10A George Street, Edinburgh; *Treasurer,* George Cleland.

EVERTON CAMERA CLUB.—Established November 1, 1896. Headquarters, Village Street, Everton, Liverpool, England. Annual meeting, December. *President,* I. Hawkins; *Vice-Presidents,* E. Allmey and T. Sanderson; *Secretary and Treasurer,* W. Tansley, Village Street, Everton.

FAKENHAM DISTRICT CAMERA CLUB.—Established 1892. Headquarters, Lancaster Temperance Hotel, Fakenham, England. Annual meeting, January. *President,* The Rev. William Martin, B.A.; *Vice-Presidents,* Thos. Charlton, Algernon Digby, M.A.; *Secretary and Treasurer,* Henry Newson, The Square, Fakenham, Norfolk. Letters, etc., to be addressed The Square, Fakenham, Norfolk.

GLASGOW PHOTOGRAPHIC ASSOCIATION.—Established 1862. Headquarters, Glasgow Philosophical Society's Rooms, Glasgow, Scotland. *President,* John Stuart; *Vice-Presidents,* J. Craig Annan and Wm. Lang, F.C.S.; *Secretary,* Chas. Macdonald, 100 W. Regent Street; *Treasurer,* George Bell.

GLASGOW AND WEST OF SCOTLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.—Established 1883. Headquarters, 180 West Regent Street, Glasgow, Scotland. Annual meeting, October. *President,* Cameron Todd; *Vice-President,* J. C. Oliver; *Secretary,* Wm. Goodwin, 3 Lynedoch Street, Glasgow; *Treasurer,* Wm. J. B. Halley.

GLENALMOND PHOTOGRAPHIC CLUB.—Established 1890. Headquarters, Trinity College, Glenalmond, Perthshire, Scotland. Annual meeting, last Saturday in September. *President,* Arthur S. Reid, M.A., F.G.S.; *Vice-President,* E. S. Lyttell; *Secretary,* T. N. J. Bell; *Treasurer,* J. G. Kennedy.

GLOSSOP DALE PHOTOGRAPHIC SOCIETY, GLOSSOP.—Re-established 1883. *President,* E. Partington, Esq., J.P.; *Vice-Presidents,* S. H. Wood, Esq., Col. W. Sidebottom, M.P.; *Secretary,* T. W. Sharpe, 1 Pikes Lane, Glossop; *Treasurer,* J. Hardman, Norfolk Square, Glossop, England.

GLOUCESTERSHIRE PHOTOGRAPHIC SOCIETY.—Established 1883. Reconstructed 1887. Headquarters, Guildhall, Gloucester, England. Annual meeting, third Monday in February. *President,* H. Medland; *Vice-President,* Dr. John Campbell; *Secretary,* E. A. Ind, Northgate Street; *Treasurer,* John Tibbills, Theresa Place.

GOLDSMITHS' INSTITUTE CAMERA CLUB.—Established 1893. Headquarters, Goldsmiths' Institute, New Cross, London, S. E., England. Annual meeting, October. *President,* I. W. Penfold, Esq.; *Vice-Presidents,* Messrs. W. I. Pope and A. A. Donald, F.R.P.S.; *Joint Secretaries,* C. B. Storey and A. H. Downey; *Treasurer,* A. W. Allan.

GOSPEL OAK PHOTOGRAPHIC SOCIETY.—Established October, 1894. Headquarters, Congregational Schools, Lismore Road, Kentish Town. Annual meeting, March. *President,* Rev. H. Le Pla; *Vice-President,* F. H. Hall; *Secretary,* W. A. Palmer, 13 Dale Road, Kentish Town, N. W.; *Treasurer,* J. E. Rayner.

GUILDFORD PHOTOGRAPHIC SOCIETY.—Established 1890. Headquarters, 36 High Street, Guildford, England. Annual meeting, last Tuesday in March. *President,* The Rt. Hon. the Earl of Onslow, G.C.M.G.; *Vice-Presidents,* G. J. Jacobs, J. Russell, A. Horsley Hinton, G. C. Williamson, Sir J. F. Leese, Q.C., M.P.; *Secretary,* A. E. Moon; *Treasurer,* J. H. Nunn.

HACKNEY PHOTOGRAPHIC SOCIETY, LONDON.—Established May, 1889. Headquarters, The Pembury Tavern, Lower Clapton, England. Annual meeting, March. *President,* W. F. Fenton-Jones; *Secretary,* Walter Selfe; *Treasurer,* Walter L. Barker.

HANDSWORTH PHOTOGRAPHIC SOCIETY.—Established 1895. Headquarters, College House, Hamstead Road, Handsworth, Birmingham, England. Annual meeting, first Thursday in January. *President,* Philip Whitehouse; *Vice-Presidents,* W. J. Foster, L.R.C.P.; E. F. Freeland, C. L. Stait, W. J. Morgan, R.B.A.; *Secretary,* A. E. Teague;. *Treasurer,* C. F. Jarvis.

HAWKES BAY CAMERA CLUB.—Established April 19, 1895. Headquarters, Regent Street, Napier (clubroom). Annual meeting, October. *President,* Dr. A. Milne-Thomson; *Vice-President,* F. Nelson; *Secretary,* W. Bes wick (C.P.O.); *Treasurer,* G. N. Pierce.

HELIOS PHOTOGRAPHIC CLUB.—Established 1887. Headquarters, 55 Locksley Street, Burdett Road, London, E. *Secretary and Treasurer,* Henry Everett, address as above.

HEREFORDSHIRE PHOTOGRAPHIC SOCIETY.—Established 1885. Headquarters, Clarence House, West Street, Hereford, England. Annual meeting, October. *President,* Ald. T. Blake, J.P.; *Vice-Presidents,* A. Watkins, Esq., T. J. Salway, Esq., J. Parker, Esq., C.E., W. M. Wilson, Esq., W. J. Humfrys, Esq., H. H. Parry, Esq.; *Honorary Secretary,* Mr. Cecil Gethen, 9 St. Nicholas Street, Hereford; *Treasurer,* Mr. W. E. Haines, High Town, Hereford.

HOLMFIRTH AMATEUR PHOTOGRAPHIC SOCIETY.—Headquarters, Holmfirth, England. Annual meeting, August. *President,* Arthur Preston; *Secretary and Treasurer,* David Bilson, Birchin House, Holmfirth.

HUDDERSFIELD NATURALIST AND PHOTOGRAPHIC SOCIETY.—Established 1847. Headquarters, Y. M. C. A. Lecture Room. Annual meeting, December. *President,* G. T. Porritt, F.L.S., F.E.S.; *Vice-Presidents,* H. G. Brierley, T. W. Woodhead; *Honorary Secretary,* A. Clarke, 9 St. Andrews Road, Huddersfield, England; *Treasurer,* A. W. Whiteley.

IPSWICH SCIENTIFIC SOCIETY, PHOTOGRAPHIC SECTION.—Established 1869. Headquarters, Museum, Ipswich, England. Annual meeting, January. *President,* The Mayor, E. P. Ridley, F.R.G.S.; *Secretary,* Frank Woolnough.

KEIGHLEY AND DISTRICT PHOTOGRAPHIC ASSOCIATION.—Established January, 1889. Headquarters, Mechanics' Institute, Keighley, England. Annual meeting, September, 2d Tuesday. *President,* Thomas Heaps, Esq.; *Vice-Presidents,* Messrs. Gill, Keighley and Pouting; *Secretaries,* Wm. H. Hainsworth, bb. Belgrave Rd., Keighley, and C. H. Smith; *Treasurer,* Walter Mitchell.

KING WILLIAMS TOWN ART AND CAMERA CLUB.—Established 1898. Headquarters, King Williams Town. Annual meeting, September. *President,* T. N. Dyer, Esq. (Mayor); *Chairman,* Dr. Chute; *Secretary,* Dr. H. A. Spencer, Maclean Street; *Treasurer,* A. G. Doble, Esq., Maclean Street.

LANCASTER PHOTOGRAPHIC SOCIETY.—Established 1889. Headquarters, Stonewell (Lancaster), England. Annual meeting, last Tuesday in March. *President,* Alan Garnett, Esq.; *Vice-Presidents,* J. W. Pickard and R. W. Wearing, Esqs.; *Secretary,* W. Briggs; *Treasurer,* J. T. Miller, Esq.

THE LEAMINGTON AMATEUR PHOTOGRAPHIC SOCIETY.—Established about 12 years. Headquarters. Pump Room, Leamington, England. Annual meeting, first week in October. *President,* Rev. Ed. Healy; *Honorary Secretary,* Signor Aspa; *Treasurer,* B. Magrath, Esq.

LEEDS PHOTOGRAPHIC SOCIETY.—Established 1852. Headquarters, Philosophical Hall. Annual meeting, December. *President,* Godfrey Bingley; *Vice-Presidents,* Peter Gilston and James Taylor; *Secretary,* J. C. Coultas, Chapel Lane, Headingly;*Treasurer,* Thos. Carter, Leeds, England.

LEWES PHOTOGRAPHIC SOCIETY.—Established 1888. Headquarters, Municipal Buildings. Annual meeting, September. *President,* S. I. Wightman, Esq.; *Vice-President,* J. Tunks, Esq.; *Secretary and Treasurer,* Geo. Carpenter, 81 High Street, Lewes, England.

LIVERPOOL AMATEUR PHOTOGRAPHIC ASSOCIATION.—Established 1863. Headquarters, Percy Buildings, Eberle Street, Liverpool, England. Annual meeting, third Thursday in January. *President,* Paul Lange; *Vice-Presidents,* John H. Welch and Dr. Llewellyn Morgan; *Secretary,* F. A. Schierwater; *Treasurer,* P. H. Phillips.

LOUGHBOROUGH AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1888. Headquarters, Devonshire Square, Loughborough, England. Annual meeting, April. *President,* W. C. Barder, Esq.; *Secretaries,* W. Clarke, H. Kelsey; *Treasurer,* H. Kelsey.

MANCHESTER AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1885. Headquarters, Manchester Athenæum and 15 Brazennose Street, Manchester, England. Annual meeting, last Tuesday in January. *President,* T. Morley Brook, Esq.; *Vice-Presidents,* Rev. H. W. Dick, G. E. Miller, J. W. Wade, G. H. B. Wheeler; *Secretary,* J. W. Parrott, 3 Elm Road, Altrincham; *Treasurer,* Chas. Dawson, Esq., 10 Chepstow Street, Manchester.

MANCHESTER Y. M. C. A. PHOTOGRAPHIC CLUB.—Established January, 1890. Headquarters, Y. M. C. A., 56 Peter Street, Manchester, England. Annual meeting, January. *President,* Geo. T. White, Esq.; *Vice-President,* A. C. Harrison, Esq.; *Honorary Secretary,* J. W. Price; *Honorary Treasurer,* Geo. Dixon.

MIDLOTHIAN CAMERA AND PORTFOLIO CLUB.—Established 1889. Headquarters, Edinburgh, Scotland. Annual meeting, November. *President,* Dr. W. Stewart; *Vice-President,* T. Wilson; *Secretary,* Alexander Calder; *Treasurer,* R. C. Ewart.

THE MONKLANDS PHOTOGRAPHIC SOCIETY.—Established February. 1893. Headquarters, Airdrie, Scotland. Annual meeting, first Tuesday of October. *President,* R. C. Platt, Esq.; *Vice-President,* W. B. Hossack, Esq.; *Secretary,* Wm. Dixon Gray, Esq.; *Treasurer,* James S. Lewis.

NEWTON HEATH CAMERA CLUB.—Established 1893. Headquarters, Wesleyan School, Oldham Road, Newton, England. *President,* Mr. Fallows; *Vice-President,* Mr. Cresswell; *Secretary,* J. Fortune.

NORTH MIDDLESEX PHOTOGRAPHIC SOCIETY.—Established 1888. Headquarters, Jubilee House, Hornsey Road, N. London. Annual meeting, second Monday in January. Weekly meetings. *President,* J. C. S. Mummery; *Vice-Presidents,* W. Brame Goodwin and A. H. Lisett; *Secretary,* H. Stuart; *Treasurer,* Henry Smith.

NOTTINGHAM CAMERA CLUB.—Headquarters, Mechanics' Institution, Nottingham, England. Annual meeting, first Friday in October. *President,* His Grace the Duke of Newcastle; *Secretary,* Lawrence Wilkens, Esq.

OLDHAM PHOTOGRAPHIC SOCIETY.—Established May, 1867. Headquarters, The Lyceum, Union Street, Oldham, England. Annual meeting, last Thursday in October. *President,* William A. Nash; *Vice-President,* R. T. Taylor; *Secretary,* Thos. Widdop, 17 Queen Street, Oldham; *Treasurer,* T. Heywood.

PAISLEY PHOTOGRAPHIC SOCIETY.—Established 1857. Headquarters, 9 Gauze Street, Paisley, Scotland. Annual meeting, April. *President,* Robert Ferrier; *Vice-President,* Thomas Reid, Jr.; *Secretary,* Robert Milne, 21 Glenview Terrace, Paisley; *Treasurer,* Andrew Morris.

PETERBORO' PHOTOGRAPHIC SOCIETY.—Established 1887. Headquarters, for monthly meetings only, the "Bedford" Hotel. Annual meeting, first Monday in June. *President,* Dr. G. Kirkwood; *Vice-Presidents,* Dr. Walker, E. Worthington, G. W. Leigh, Esq.; *Secretary,* A. W. Nicholls, 11 Cromwell Road, Peterboro', England; *Treasurer,* H. C. Lilley.

PHOTOGRAPHIC SECTION NORTHAMPTON NATURAL HISTORY AND FIELD CLUB.—Headquarters, 8 Abington Street, Northampton, England. Annual meeting (no fixed date). *President,* H. Manfield, Esq.; *Secretary and Treasurer,* Charles H. Dorman, A.R.I.B.A.

PHOTOGRAPHIC SECTION OF THE YORKSHIRE PHILOSOPHICAL SOCIETY. Established 1888. Headquarters, The Museum, York, England. Annual meeting, October, first Wednesday. *President,* Tempest Anderson, Esq., M.D., J.P.; *Secretary and Treasurer,* H. Dennis Taylor, F.R.A.S., Trenfield, Holgate, York.

PHOTOGRAPHIC SOCIETY OF IRELAND.—Headquarters, 35 Dawson Street, Dublin, Ireland. Annual meeting, April. *President,* Alfred Werner; *Vice-Presidents,* T. Ruthven, A. M. Geddis; *Secretary,* Victor E. Smyth; *Treasurer,* Wm. Bewley.

THE POSTAL PHOTOGRAPHIC CLUB.—Established October, 1886. This Club is the oldest postal photographic society in England, with the exception of "The Talbot Album Club," which was started a few months earlier in the same year. Headquarters, Walton Manor Lodge, Oxford, England. Number of members limited to 30. *Secretary and Treasurer,* Reginald A. R. Bennett, M.A. (Oxon).

PUTNEY PHOTOGRAPHIC SOCIETY.—Established 1890. Headquarters, 102 High Street, Putney, Surrey, England. Annual meeting, May. *President,* R. W. J. Sheppard; *Vice-Presidents,* John A. Hodges, F.R.P.S., H. Kimber, M.P., and L. S. Zachariasen; *Secretary and Treasurer,* Wm. Martin, 4 Lower Parkfields, Putney, S. W.

RAMSGATE CAMERA CLUB.—Established 1894. Headquarters, Victoria Temperance Hotel, Ramsgate, England. Annual meeting, March. *President,* vacant; *Vice-Presidents,* E. E. Wastall, Esq., J.P.; W. C. Bull, B.A., and W. T. Davey, Esq.; *Secretary and Treasurer,* Frederick I. Bear, 1 Guilford Lawn.

RICHMOND CAMERA CLUB.—Established 1890. Headquarters, Greyhound Hotel, Richmond, England. Annual meeting, May. *President,* F. P. Cembrano; *Vice-Presidents,* E. D. Purcell, G. Ardaseer; *Secretary,* C. H. Davis; *Treasurer,* J. B. Huddy.

ROCHDALE AND DISTRICT PHOTOGRAPHIC SOCIETY.—Established 1890. Headquarters, unsettled. *President,* I. A. Bright, Esq., J.P.; *Secretaries,* H. and W. Bamford, 242 Yorkshire Street, Rochdale, England.

RODLEY PHOTO SOCIETY.—Established 1893. Headquarters, Rodley, near Leeds, England. Annual meeting, January. *President,* A. G. Bentley; *Secretary and Treasurer,* H. Crossley, Rodley, near Leeds.

ROTHERHAM PHOTOGRAPHIC SOCIETY.—Established October, 1889. Headquarters, 5 Frederick Street, Rotherham, England. Annual meeting, October. *President,* Dr. F. B. Judge Baldwin; *Vice-Presidents,* E. I. Hubbard, M.S.A., James Leadbeater and James Turner; *Secretary,* Henry C. Hemmingway, F.U.I.; *Treasurer,* Alfred S. Lyth.

ROYAL PHOTOGRAPHIC SOCIETY.—Established 1853. Headquarters, 66 Russell Square, London, W. C. Annual meeting, second Tuesday in February. *President,* The Rt. Hon. the Earl of Crawford, K. T.; *Honorary Secretary,* Maj.-Gen. J. Waterhouse, I.S.C.; *Assistant Secretary,* A. W. W. Bartlett; *Treasurer,* George Scannell.

SCARBOROUGH AND DISTRICT PHOTOGRAPHIC SOCIETY.—Established 1893. Headquarters, The Museum, Scarborough, England. Annual meeting, October. *President,* Mr. James Henry Rountree; *Vice-President,* Dr. Frederic Dale; *Secretary and Treasurer,* Mr. Harry Wanless, 31 Westborough, Scarborough.

SHEFFIELD OPTICAL LANTERN SOCIETY.—Established 1890. Headquarters, Saint Paul's Schools, Cambridge Street. Annual meeting, October 20. *President,* Dr. J. A. Manton; *Vice-Presidents,* Messrs. J. H. Lygo, J. Clowes; *Secretary,* T. G. F. Allen, 59 Melrose Road, Sheffield, England.

SOUTHSEA AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1888. Headquarters, 5 Pembroke Road, Portsmouth, England. Annual meeting, January. *President,* Mr. G. Whitefield; *Vice-President,* Mr. H. T. Lilly, M.A.; *Secretary,* M. F. J. Mortimer; *Treasurer,* Mr. Gilbert Wood, A.R.I.B.A.

STEREOSCOPIC CLUB, THE.—*President,* James Whitelegg; *Secretary,* W. I. Chadwick, 26 King Street, Manchester, England.

STEREOSCOPIC SOCIETY, THE.—Established 1893. Headquarters, Huntly, N. B., Scotland. *President,* W. Stainthorpe, M.D., J.P.; *Vice-Presidents,* Victor Selb, F. Dunsterville; *Secretary and Treasurer,* B. Diveri, B.A.

SUN & CO.; POSTAL PHOTOGRAPHIC CLUB.—Established 1886. *Secretary,* Martin J. Harding, Myrtle Villa, Hawthorn Road, Shrewsbury, England.

SWANSEA ART SOCIETY (name recently changed), Swansea, England. Established 1885. Headquarters, Royal Institution of South Wales. Annual meeting, November. *President,* Colonel Morgan, R.E.; *Secretary,* Wm. Terrill; *Treasurer,* Arch. Goldie.

TALBOT ALBUM CLUB.—*Honorary Secretary,* Fred. H. Davies, 265 Coventry Road, Birmingham, England.

TUNBRIDGE WELLS AMATEUR PHOTOGRAPHIC ASSOCIATION.—Established January, 1887. Headquarters, Club Room, Mechanics' Institute, Tunbridge Wells, England. Annual meeting, January. *Patron,* Sir David Salomons, Bt., M.A.; *President,* F. G. Smart, M.A.; *Vice-Presidents,* E. R. Ashton, Rev. A. T. Scott, M.A., Rural Dean; *Secretary,* Joseph Chamberlain; *Treasurer,* B. Whitrow.

UTTOXETER PHOTOGRAPHIC SOCIETY.—Established 1890. Headquarters, Carter Street, Uttoxeter, England. Annual meeting, April. *President,* Rev. C. F. L. Barnwell; *Vice-Presidents,* Hugo Meynell, Esq., and F. A. Bolton, Esq.; *Secretary,* Alfred Parker, Esq.; *Treasurer,* R. T. A. Hardy, Esq.

WALSALL AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1892. Headquarters, George Hotel, Walsall, England. Annual meeting, September 30. *President,* S. A. Newman, Esq.; *Secretary and Treasurer,* E. A. Day, 14 Westbourne Road, Walsall.

WALTON PHOTOGRAPHIC SOCIETY, LIVERPOOL.—Established 1889. Headquarters, Walton Church Schools. Annual meeting, February. *President,* Geo. Latimer; *Secretary and Treasurer,* J. Bickerstaff, 79 Rancliffe Road, Walton, Liverpool, England.

WARRINGTON PHOTOGRAPHIC SOCIETY.—Established 1887. Headquarters, Warrington Technical Institute. Annual meeting, January. *President,* John Fairhurst; *Vice-Presidents,* H. N. Houghton, H. Bond; *Secretary,* F. W. Knowles, 77 Bridge Street, Warrington, England; *Treasurer,* Peter Dalton.

WEST LONDON PHOTOGRAPHIC SOCIETY.—Established 1888 Headquarters, Broadway Lecture Hall, Hammersmith. Annual meeting, second Friday in October. *President,* G. Lamley, Esq.; *Past President,* G. F. Blackmore, Esq.; *Secretary,* Alfred Ebes, 183 The Grove, Hammersmith, England; *Treasurer,* H. Selby.

WINDSOR AMATEUR RESEARCH CAMERA CLUB.—Established 1893. Headquarters, Montpelier House, Belfast, Ireland. Annual meeting, December. *President,* Lord Mayor of Belfast, James Henderson, Esq., J.P.; *Vice-President,* James Collins; *Secretary,* Wm. Jas. Gibson, Montpelier House, Belfast; *Treasurer,* Robert B. Gardiner.

WOOLWICH PHOTOGRAPHIC SOCIETY.—Established 1892. Headquarters, St. John's Schools, Woolwich, England. Annual meeting, October, second Thursday. *President,* Mr. W. H. Dawson; *Vice-Presidents,* Col. C. D. Davies and Mr. C. Churchill; *Secretary and Treasurer,* Frederick W. Nachen.

WORCESTERSHIRE PHOTOGRAPHIC SURVEY SOCIETY.—Established March 16, 1896. Headquarters, Victoria Institute, Worcester, England. Annual meeting, January or February. *President,* J. W. Willis Bund, Esq.; *Secretary,* Thos. J. Hobson, 15 Albany Terrace, Worcester; *Treasurer,* Mrs. Berkeley, Cotheridge Court, Worcester.

YORK PHOTOGRAPHIC SOCIETY.—Established 1887. Headquarters, Victoria Hall, York, England. Annual meeting, January. *President,* W. Weatherill; *Vice-President,* A. H. Hardcastle; *Secretary,* Frederick G. P. Benson; *Treasurer,* R. Bainbridge.

OTHER FOREIGN SOCIETIES

AMATEUR FOTOGRAFEN VEREENIGING AT AMSTERDAM (HOLLAND).—Established September 1, 1887. Headquarters, Handboogstraat 2. Meetings on Wednesday, fortnightly. *President,* Ign. Bispinch; *Secretary,* D. Wilmerink; *Treasurer,* A. W. de Flines.

AMATEUR PHOTOGRAPHIC ASSOCIATION OF VICTORIA.—Established June 18, 1883. Headquarters, Melbourne. Annual meeting, March. *President,* J. C. Kaufmann, LL.D.; *Vice-Presidents,* E. C. Bell, H. C. Ward; *Secretary,* J. H. Harvey; *Treasurer,* F. W. Miscamble.

AMATEUR PHOTOGRAPHIC SOCIETY OF MADRAS.—Headquarters, Madras, India. Annual meeting, January. *President,* C. Michie Smith, B.Sc., F.R.S.E.; *Vice-Presidents,* F. Dunsterville, F.R.P.S., C. E. Phipps; *Honorary Secretary,* Samuel Jackson, A.R.C.Sc. (Lond.), F.I.C.; *Honorary Treasurer,* V. G. Lynn.

AMATEUR PHOTOGRAPHEN-VEREIN IN LIEGNITZ.—Established 6th December, 1891. Mitglied des Verbandes deutscher und oesterreichischer Amateur-Photographen, Regelmässige Vereinssitzungen Freitag nach dem 1. und 15. eines jeden Monats. Annual meeting, im Februar jedes Jahres. *President,* Max Engler, Ober-Postassistent; *Secretary and Treasurer,* Erdmann Loebner.

AMATOR FOTOGRAFEN, CHRISTIANIA.—Established April 24, 1888. Headquarters, Christiania. *President,* Dr. Oscar Platon, Professor at the University, Christiania; *Vice-President,* A. T. Blixrud; *Secretary,* Alb. Rynning; *Treasurer,* I. J. Mörch.

AMATEUR-PHOTOGRAPHEN-VEREENIGING "DAGUERRE."—Established Groningen, Holland. *President,* G. P. Smith; *Vice-President,* R. Roelfsema Pyn; *Secretary,* N. de Jager; *Treasurer,* J. Goeter.

ASSOCIATION BELGE DE PHOTOGRAPHIE.—Established Brussels. Annual meeting, April. *President,* J. Casier; *Vice-Presidents,* J. Maes and F. Massange de Louvrex; *Secretary,* M. Vanderkindere; *Treasurer,* A. Nyst.

ASSOCIAZIONE DEGLI AMATORI DI FOTOGRAFIA.—Established Roma. Headquarters, Via Nazionale 143a. *President,* Antonio Ruffo, Principe della Scaletta; *Vice-President,* Comm. Carlo Encrani; *Secretary,* Aev. Giuseppe Martini; *Treasurer,* Br. Francesco Bondesio.

AUCKLAND PHOTOGRAPHIC CLUB.—Established 1885. Headquarters, Club Rooms, Grey Street. *President,* Dr. J. Logan Campbell; *Vice-Presidents,* J. R. Hanna, Jos. Martin, Ele Sayton; *Secretary,* H. R. Arthur, care Auck. Gas Co.; *Treasurer,* W. Gatenby.

"CAMERA & CO." A POSTAL PHOTOGRAPHIC CIRCULATING CLUB.—Established May, 1891. Headquarters, 14 Market Street, Pontypridd, South Wales. Monthly portfolios. *Honorary Secretary,* Albert O. Forrest.

CAPE TOWN PHOTOGRAPHIC CLUB.—Established 1890. Headquarters, Y. M. C. A., Cape Town. Annual meeting, first Thursday in November. *President,* David Gill, LL.D., F.R.S., etc.; *Vice-President* (changes annually); *Secretary and Treasurer,* Hy. Bishop, Afr. Bankg. Corp., Cape Town.

CIRCOLO FOTOGRAFICO LOMBARDO.—400 members. Milano, Via Principe Umberto, 30. *President,* Conte Cesare del Majno; *Vice-President,* Zambellini Avv. Michele; *Secretary,* Borghi Dott. Giuseppe; *Director,* Chizzolini Ing. Antonio; *Manager,* Ritter Vittorio; *Councillors,* Bassani Gigi, Canetta Rag. Ettore; *Auditor of Accounts,* Vittorio Zuccoli-Ing. Piero Fontana.

CLUB ALPIN SUISSE.—Fondé en 1863. Headquarters, Neuchatel (Comité central). *President,* M. Engène Colomb; *Vice-President,* M. Alexandre Perrochet; *Secretary,* Dr. Charles Meckenstock; *Treasurer,* M. Fritz Sandoz.

CLUB DER AMATEUR FOTOGRAFEN.—Established Salzburg, Gründungs Jahr 1891. Sitzunzen Monatlich. *President,* KK. Ober Commiss Adolf Porm; *Vice-President,* Br. von. Lilien, Rittmeister; *Secretary,* kk. forstsecretar Dr. Franz Huemer, Fünphaus.

CORRESPONDENZ-VEREIN VON FREUNDEN DER PHOTOGRAPHIE.—Established 1889. Die Mitglieder, die innerhalb Deutschland wohnen, verkehren mit einander durch Wanderkästen. *Hauptordner,* Pastor M. Allihu; *Ordner des I. Kreises,* O. Küllenberz; *des II. Kreises,* Graf. Rothkirch; *des III. Kreises,* G. Richter.

DEUTSCHE GESELLSCHAFT VON FREUNDEN DER PHOTOGRAPHIE.—Established 1887. Headquarters, Königliche Kriegs Akademie. Annual meeting, Photographische Rundschau. *President,* Geheimrath Prof. Dr. Tobold; *Secretary,* Dir. Schultz-Hencke; *Treasurer,* Banquier Gvemann.

DEUTSCHER PHOTOGRAPHEN-VEREIN.—Established 1876 (29 Dezember). Headquarters, Weimar. Alljährlich eine Wanderversammlung. *President,* K. Schwier, Weimar; *Vice-President,* Karl Wunder, Hannover; *Secretary,* C. Kesselhuth, Hildesheim; *Treasurer,* K. Schwier, als Geschäftsführer.

DILETTANTI FOTOGRAFI DI NAPOLI (CAMERA CLUB).—Established 1891. Headquarters, Villa Communale Napoli. Annual meeting, Decembre e Gennaio di ogni anno. *President,* Duca di Schiavi; *Vice-President,* Sigr. Waldemaro Fuchs; *Secretary,* Sigr. Cav. Raffaele Montuoro; *Treasurer,* Sigr. Cav. Luigi Fortunato.

GORDON COLLEGE AMATEUR PHOTOGRAPHIC ASSOCIATION.—Established 1889. Headquarters, Gordon College, Geelong. Annual meeting, July. *President,* H. G. Roebuck, Esq.; *Vice-Presidents,* W. H. Thacker, Esq., J. Farr Dentry, Esq.; *Secretary,* J. Hammerton, Jr., "Burngrease," Geelong, Vic.; *Treasurer,* R. Collins Hocking, Esq.

MONTREAL CAMERA CLUB.—Established 1890. Incorporated 1893. Headquarters, 4 Phillips Square, Montreal. Annual meeting, first Tuesday in May. *President,* George Sumner; *Vice-President,* Alfred W. Cole; *Secretary and Treasurer,* A. Clarence Lyman, 157 St. James Street, Montreal.

NELSON CAMERA CLUB, NELSON, N. Z.—Established 1888. Headquarters, Nelson. Annual meeting, May. *President,* C. Y. Fell; *Secretary,* Arthur H. Patterson; *Treasurer,* F. Washbourne.

NORTHERN TASMANIAN CAMERA CLUB.—Established 1889. Fifty-one members. Headquarters, Launceston, Tasmania. Annual meeting, July. *President,* Wm. Gibson; *Vice-Presidents,* F. C. Birchall, R. C. Kermode, W. H. Twelvetrees; *Secretary and Treasurer,* F. Styant Browne, 112 Brisbane Street, Launceston.

OTTAWA CAMERA CLUB, OTTAWA, CANADA.—Established 1894. Headquarters, Ottawa, Canada. Annual meeting, 2d Thursday in October of each year. *President,* William Ide; *Vice-President,* Miss I. M. Ballantyne; *Secretary and Treasurer,* A. A. Pinard.

PHOTO-CLUB DE LYON.—Established en 1888. Headquarters, 12 Rue de la Charité. Annual meeting, December. *President,* Regis Flachat; *Vice-Presidents,* Lucien Begule et C. Bernard; *Secretary,* Charles Bouchage; *Treasurer,* Ferdinand Abel.

PHOTO-CLUB ORAN, ALGERIA.—Established 1892. Headquarters, 12 Boulevard Séguin. Annual meeting, second Sunday in December. *President,* A. Godillot, notaire; *Vice-President,* Capitaine Michel, du 2d Regiment des Zouaves; *Secretary,* J. S. Levy, 51 Bd. National; *Treasurer,* E. Brenant.

PHOTO-CLUB ROUENNAIS.—Société d'Amateurs Photographes, fondée 1891. Siège social, Hôtel des Sociétés savantes. Atelier de pose—Laboratoire—Bibliothèque, salle de lecture, ouvrages et journaux spéciaux, Rue de la République, 43. *President,* M. Abel Buguet, A.; *Vice-Presidents,* MM. Louis Chesneau-Lethuillier, Albert Marguery; *Treasurer,* Charles Lebert; *Secretary,* Maurice Lucas, rue du Sacre, 9; *Assistant Secretary,* Reneé Duval, rue Danguy, 1.

PHOTOGRAPHIC SOCIETY OF INDIA, THE.—Established 1886. Headquarters, 57 Park Street, Calcutta. Annual meeting, June. *President,* P. Donaldson, Esq.; *Vice-Presidents,* T. A. Pope, Esq., and N. Gianna Couplo, Esq.; *Secretary,* W. R. Donogh, Esq.; *Treasurer,* C. H. Coates, Esq.

PHOTOGRAPHISCHE GESELLSCHAFT WINTERTHUR.—Established 1893. Headquarters, Winterthur, Switzerland. Meetings, circa 12. *President,* A. Sulzer-Seifert; *Vice-President,* Dändliker; *Secretary,* Wurz; *Treasurer,* Mayerhofer

PHOTOGRAPHISCHER VEREIN ZU BERLIN.—Established 1863. Headquarters, Architekten-Vereinshaus, Berlin, S. W. Meetings, Jeden 3ten Donnerstag im Monat. *President,* Hofphotograph Paul Grundner; *Vice-President,* Hofphotograph T. Reichard; *Secretary,* Director D. Schultz-Hencke; *Treasurer,* E. Martini i. fa. Schippang & Co.

PHOTOGRAPHISCHER VEREIN IN GOTTINGEN.—Established Mai, 1893. Headquarters, Hotel "Englisher Hof" in Göttingen. Annual meeting, April. *President,* Dr. Götting; *Secretary,* Professor Dr. Abegg; *Treasurer,* Horstmann.

PHOTOGRAPHISCHE GESELLSCHAFT.—Established 1861. Headquarters, in Wien. Annual meeting, Januar. President, Ottomar Volkmer; *Vice-President,* Dr. Carl Böhm Edler von Böhmersheim; *Secretary,* Dr. Joseph Székely; *Treasurer,* Ludwig Schrank.

PHOTO-UNION FRANCAISE.—Headquarters, Rue du Pont-Mouja No. 1. (20 membres.) Réunion tous les mois. *President,* Aéiné Voignier; *Vice-President,* Charles Schmitt; *Secretary,* Felix Roy; *Treasurer,* Henri Chouvenin.

PORT ELIZABETH AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1890. Port Elizabeth, So. Africa. Headquarters, The Studio Athenæum. Annual meeting, third Thursday in July. *President*, A. Walsh, Esq.; *Chairman*, W. Alcock, Esq.; *Secretary*, F. C. Raph; *Treasurer*, J. Lewis.

QUEENSLAND AMATEUR PHOTOGRAPHIC SOCIETY.—Established 1883. Headquarters, Brisbane. Annual meeting, January (third Wednesday). *President*, Dr. John Thomson; *Vice-Presidents*, Dr. Wheeler, Mr. C. J. Pound, Mr. H. W. Mobsby; *Secretary*, Mr. W. C. Voller; *Treasurer*, Mr. J. L. Kinloch.

SCHWEIZERISCHER PHOTOGRAPHEN VEREIN.—Established 1886. *President*, E. Pricam, Genl ; *Vice-President*, R. Ganz, Zürich; *Secretary*, Hermann Linck, Winterthur; *Treasurer*, A. Wicky, Bern; *Bibliothekar*, Ph. Linck, Zürich.

SOCIETE DES AMATEURS PHOTOGRAPHES DE PARIS.—Established à Paris. Headquarters, 339 rue St. Martin. *President*, H. Laedlein; *Vice-President*, Dufresne; *Secretary*, Maxime Brault, 97 Bi Malesherbes (Paris) ; *Treasurer*, Mongodin.

SOCIETE D'ETUDES PHOTOGRAPHIQUES DE PARIS.—Headquarters à Paris, 11 rue Salneuve, chez M. Balagny. Assemblée Générale tous les mois. *President*, Balagny, Docteur en Droit; *Vice-President*, Villain, chimiste; *Secretary*, Normand, membre de l'Institut de France; *Treasurer*, M. Lepetit.

SOCIETE FRANCAISE DE PHOTOGRAPHIE.—Fondée en 1854. Headquarters 76 rue des Petits Champs, Paris. Réunions le 1er Vendredi de chaque mois sauf en Septembre et Octobre. *President*, M. Lippmann; *Vice-President*, M. A. Davanne; *Secretary*, M. L. Pector; *Treasurer*, M. Andra.

SOCIETE GENEVOISE DE PHOTOGRAPHIE.—Established 1881. Headquarters, Grand Mésel 1., Genève. Meeting, every month. *President*, Dr. A. Mazel; *Vice-President*, Dr. E. Batault; Secretary, T. Bosson; *Treasurer*, Ls. Jaquerod.

SOCIETE PHOTOGRAPHIQUE DE RENNES.—Headquarters, 4 rue de la Chalotais. *President*, Georges Fontaine; *Vice-President*, Vicomte Ch. de Rengervé; *Secretary*, Auguste Morel.

SOCIETE PHOTOGRAPHIQUE PROFESSIONALE, SUCCEDANT A CERCLE DES EFFIGISTES ET SOCIETE DES EMPLOYES PHOTOGRAPHES.—Established 1878, 30 membres. Headquarters, Place St. Gervais, 6. Annual meeting, Juillet. Réunion 1er Lundi de chaque mois. *President*, T. Dovaz, 3, rue des Minoteries; *Vice-President*, F. Mazuy, 4 Place Cornavin; *Secretary*, A. Chevalley, rue Pradier, 9; *Treasurer*, F. Barral, rue des Bains. Toutes les communications au Secrétaire.

SOUTH AUSTRALIAN PHOTOGRAPHIC SOCIETY.—Established 1885. Headquarters, Chamber of Manufactures, Adelaide. Annual meeting, 2d Thursday in July. *President*, C. L. Whitham; *Vice-Presidents*, R. F. Griffiths and Andrew Scott, B.A.; *Secretary*, J. Gazard, 111 King William Street, Adelaide; *Treasurer*, S. P. Bond.

TORONTO CAMERA CLUB.—Incorporated 1893. Headquarters, Forum Building, Yonge and Gerrard Streets. Annual meeting, 1st Monday in November. *President*, Edmund E. King, M.D.; *Vice-President*, W. H. Moss; *Secretary and Treasurer*, John J. Woolnough.

TORONTO CENTRAL Y. M. C. A. CAMERA CLUB, THE.—Established 1899. Headquarters, Toronto, Ontario. *President*, Dr. Price; *Vice-President*, W. R. Moffat; *Secretary and Treasurer*, John Powell.

UNION NATIONALE DES SOCIETES PHOTOGRAPHIQUES DE FRANCE.—Established en 1892. Headquarters, 76 Rue des Petits-champs, Paris. Annual meeting, Pentecote. *President*, M. Janssen, de l'Institut; *Vice-President*, M. Bucquet (M.); *Secretary*, M. Pector (S.); *Treasurer*, M. Berthaud (M.).

VEREIN VON FREUNDEN DER PHOTOGRAPHIE.—Established Braunschweig, 1889. Headquarters, Hôtel Preussischer Hof. Meeting, Monatlich, am Mitwoch nach dem 15ten. *President*, Dr. phil. David Kaempfer; *Vice-President*, Dr. med. Felix Aronheim; *Secretary*, Adolf Steinhausen; *Treasurer*, Willy Berge.

VEREIN VON FREUNDEN DER PHOTOGRAPHIE ZU JENA.—Established 1. September, 1891. Meetings, Jeden 1. und 3. Donnerstag im Monat im Gasthof zur Guten Quelle. Praktischer Rathgeber. *President*, Konrad Roch; *Vice-President*, C. Hoffmann; *Secretary*, Oscar Trinkler; *Treasurer*, Carl Spath.

VEREIN ZUR FOERDERUNG DER PHOTOGRAPHIE.—Established 1864. Headquarters, Berlin. Annual meeting, 1. April. Meetings twice a month. *President*, Prof. O. Raseldorff; *Vice-President*, Dr. E. Vogel; *Secretary*, P. Hanneke, W. Bülowstr. 99; *Treasurer*, Just. Schmidt, W. Lützow 27.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KUENSTE.—Established in 1875. Headquarters, Frankfort-a-M. Annual meeting in October. *President*, Professor F. Schmidt, at Karlsruhe; *Vice-President*, Herm. Maas, Photographer, Frankfort-a-M.; *Secretary*, Th. Haake, Manufacturer, owner of the firm of Haake & Albers, at Frankfort-a-M.; *Treasurer*, C. Böttcher, Photographer, Frankfort-a-M.

WELLINGTON CAMERA CLUB.—Established 1892. Headquarters, Wellington, New Zealand. Annual meeting, second Thursday in October. *President*, A. de Bathe Brandon; *Vice-Presidents*, T. McLellan and A. C. Gifford; *Secretary*, J. A. Heginbotham; *Treasurer*, T. M. Hardy.

TABLES

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TABLE OF THE ELEMENTS:

THEIR SYMBOLS, ATOMIC WEIGHTS, AND EQUIVALENTS.

	Symbol.	Atomic Weight.	Equivalent.		Symbol.	Atomic Weight.	Equivalent.
Aluminium	Al	27.02	9.007	Mercury	Hg	199.8	99.9
Antimony	Sb	120.	40.	Molybdenum	Mo	95.8	19.16
Arsenic	As	74.9	24.97	Nickel	Ni	58.6	29.3
Barium	Ba	136.8	68.4	Niobium	Nb	94.	31.33
Beryllium	Be	9.08	4.54	Nitrogen	N	14.01	4.67
Bismuth	Bi	208.	69.33	Osmium	Os	193.	24.125
Boron	B	10.9	3.66	Oxygen	O	15.96	7.98
Bromine	Br	79.75	79.75	Palladium	Pd	106.2	26.55
Cadmium	Cd	112.	56.	Phosphorus	P	30.96	10.32
Cæsium	Cs	133.	132.7	Platinum	Pt	194.3	48.575
Calcium	Ca	39.9	19.95	Potassium	K	39.04	39.04
Carbon	C	11.97	2.99	Rhodium	Ro	104.	26.
Cerium	Ce	139.9	46.6	Rubidium	Rb	85.2	85.2
Chlorine	Cl	35.37	35.37	Ruthenium	Ru	104.4	26.1
Chromium	Cr	52.4	26.2	Selenium	Se	78.8	39.4
Cobalt	Co	59.	29.5	Silicon	Si	28.3	7.
Copper	Cu	63.2	31.6	Silver	Ag	107.66	107.66
Didymium	Di	143.0	47.8	Sodium	Na	23.	23.
Erbium	E	165.9	55.3	Strontium	Sr	87.3	43.65
Fluorine	F	19.1	19.1	Sulphur	S	31.98	15.99
Gallium	Ga	69.	23.	Tantalum	Ta	182.	60.67
Gold	Au	197.	65.66	Tellurium	Te	125.	62.5
Hydrogen	H	1.	1.	Thallium	Tl	203.64	203.64
Indium	In	113.4	37.8	Thorium	Th	231.87	57.97
Iodine	I	126.53	126.53	Tin	Sn	117.8	58.9
Iridium	Ir	192.5	48.125	Titanium	Ti	48.0	12.
Iron	Fe	55.9	27.95	Tungsten	W	183.6	30.6
Lanthanum	La	138.5	46.17	Uranium	U	240.	60.
Lead	Pb	206.4	103.2	Vanadium	V	51.2	17.07
Lithium	Li	7.01	7.01	Yttrium	Y	89.6	29.87
Magnesium	Mg	24.	12.	Zinc	Zn	65.2	32.6
Manganese	Mn	55.	27.5	Zirconium	Zr	90.	45.

NOTE.—The equivalent numbers are the smallest quantities of the element that unite with one part of hydrogen, eight parts of oxygen, or thirty-five parts of chlorine.

THE CONVERSION OF GRAMMES (OR CUBIC CENTIMETERS) INTO OUNCES AND GRAINS, and *vice versa*.

Conversion of Grammes into Grains.

Grammes.	Grains.
1	15.43
2	30.86
3	46.29
4	61.73
5	77.16
6	92.59
7	108.03
8	123.46
9	138.89

Conversion of Grains into Grammes.

Grains.	Grammes.
1	.0648
2	.1296
3	.1944
4	.2592
5	.3240
6	.3888
7	.4536
8	.5184
9	.5832

Conversion of Grammes into Troy Ounces.

Grammes.	Troy Ounces.
1	.03215
2	.06430
3	.09645
4	.12860
5	.16075
6	.19290
7	.22505
8	.25720
9	.28935

Conversion of Troy Ounces into Grammes.

Troy Ounces.	Grammes.
1	31.103
2	62.207
3	93.310
4	124.414
5	155.517
6	186.621
7	217.724
8	248 828
9	279.931

Conversion of Grammes into Avoirdupois Ounces.

Grammes.	Avoirdupois Ounces.
1	.03527
2	.07054
3	.10581
4	.14108
5	.17635
6	.21162
7	.24689
8	.28216
9	.31743

Conversion of Avoirdupois Ounces into Grammes.

Avoirdupois Ounces.	Grammes.
1	28.349
2	56.699
3	85.048
4	113.398
5	141.747
6	170.097
7	198.446
8	226.796
9	255.145

The use of the tables will be best illustrated by an example. Supposing that it is desired to find the equivalent in grains of 324.51 grammes, we proceed by breaking up this number into the following series of constituent parts, and finding the grain-equivalent of each part from the table.

Portions of original number.	Equivalents in grains.
300.	4630.
20.	308.6
4.	61.73
.50	7.716
.01	.1524
	5008.1984

The required quantity is 5008.2 grains. The numbers taken from the table will, in most cases, require a change as regards the position of the decimal point; thus, to find the value of 300 grammes, one refers to the table and finds 46.30 given as the equivalent, and a mere shifting of the decimal point two places towards the right multiplies this by 100, or gives the required number. In a similar manner, by shifting the decimal place of 30.86 one place to the right, we obtain the value in grains of 20 grammes; while the number 61.73 is taken from the table without alteration as the equivalent of 4 grammes. For .50 the table number must have its point shifted to the left, making it 7.716 instead of 77.16; and finally the value of .01 is obtained by shifting the point of 15.43 two places to the left.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide (Coml.)	Cadmium Bromide (Anhyd.).	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide....	1	.823	.951	.57	.72	.87	1.832	1.675	.676	.59	.653	.535
Potassium "	1.215	1	1.156	.692	.876	1.058	2.226	2.036	.821	.717	.794	.651
Sodium "	1.051	.865	1	.599	.757	.915	1.925	1.761	.71	.62	.686	.563
Cadmium " com.	1.755	1.444	1.67	1	1.265	1.527	3.215	2.94	1.186	1.035	1.146	.94
" " anh.	1.387	1.141	1.32	.79	1	1.207	2.542	2.324	.938	.819	.906	.743
Zinc "	1.149	.945	1.093	.655	.828	1	2.104	1.925	.776	.678	.75	.615
Ammonium chloride.....	.546	.449	.519	.311	.393	.475	1	.914	.369	.322	.356	.292
Sodium "	.597	.491	.568	.34	.43	.519	1.093	1	.403	.352	.39	.319
Ammonium iodide......	1.479	1.217	1.408	.843	1.066	1.287	2.712	2.478	1	.873	.966	.792
Potassium "	1.695	1.394	1.612	.965	1.221	1.475	3.104	2.839	1.145	1	1.107	.907
Sodium "	1.53	1.259	1.456	.872	1.103	1.332	2.803	2.564	1.034	.903	1	.819
Cadmium "	1.867	1.536	1.776	1.064	1.345	1.625	3.42	3.128	1.262	1.102	1.22	1

Table No. II gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in large type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed "Ammonium Bromide," we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide, we take the number in the same column which stands against the latter salt in the margin, viz., 1.215; that is to say, 1.215 grain of potassium bromide will be required to do the same work as one.

THE SIMPLIFICATION OF EMULSION CALCULATIONS.

From British Journal of Photography Almanac.

With a view of simplifying the calculations involved in emulsion making, Mr. William Ackland has worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognized style will find their labors materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide....	98.	1.734	.576	1.918	.521	1.106
Potassium "	119.1	1.427	.700	1.578	.638	
Sodium "	103.	1.650	.606	1.825	.548	
Cadmium " com.	172.	.988	1.012	1.093	.915	
" " anh.	136.	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride....	53.5	3.177	.315	2.682	.373	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide......	145.	1.172	.853	1.620	.617	1.382
Potassium "	166.1	1.023	.977	1.415	.707	
Sodium "	150.	1.133	.882	1.566	.638	
Cadmium "	183.	.929	1.076	1.284	.778	

The principal bromides, chlorides and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. 1 presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:

Bromide of potassium............	150 grains.	Chloride of ammonium..........	10 grains.
Iodide of potassium..............	10 "	Gelatine.........................	200 "

Now, we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:

Potassium bromide...........................150 × 1.427 =	214.	Weight silver nitrate required.
" iodide.............................. 10 × 1.023 =	10.23	
Chloride of ammonium........................ 10 × 3.177 =	31.77	
or the total quantity of silver nitrate required for full conversion..	256. grains.	

THERMOMETRIC TABLES.

Showing the Assimilation of the Thermometers in Use Throughout the World.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80.0	212.0	49	39.2	120.2
99	79.2	210.0	48	38.4	118.4
98	78.4	208.4	47	37.6	116.6
97	77.6	206.6	46	36.8	114.8
96	76.8	204.8	45	36.0	113.0
95	76.0	203.0	44	35.2	111.2
94	75.2	201.2	43	34.8	109.4
93	74.4	199.4	42	33.6	107.6
92	73.6	197.6	41	32.8	105.8
91	72.8	195.8	40	32.0	104.0
90	72.0	194.0	39	31.2	102.2
89	71.2	192.2	38	30.4	100.4
88	70.4	190.4	37	29.6	98.6
87	69.6	188.6	36	28.8	96.8
86	68.8	186.8	35	28.0	95.0
85	68.0	185.0	34	27.2	93.2
84	67.2	183.2	33	26.4	91.4
83	66.4	181.4	32	25.6	89.6
82	65.6	179.6	31	24.8	87.8
81	64.8	177.8	30	24.0	86.0
80	64.0	176.0	29	23.2	84.2
79	63.2	174.2	28	22.4	82.4
78	62.4	172.4	27	21.6	80.6
77	61.6	170.6	26	20.8	78.8
76	60.8	168.8	25	20.0	77.0
75	60.0	167.0	24	19.2	75.2
74	59.2	165.2	23	18.4	73.4
73	58.4	163.4	22	17.6	71.6
72	57.6	161.6	21	16.8	69.8
71	56.8	159.8	20	16.0	68.0
70	56.0	158.0	19	15.2	66.2
69	55.2	156.2	18	14.4	64.4
68	54.4	154.4	17	13.6	62.6
67	53.6	152.6	16	12.8	60.8
66	52.8	150.8	15	12.0	59.0
65	52.0	149.0	14	11.2	57.2
64	51.2	147.2	13	10.4	55.4
63	50.4	145.4	12	9.6	53.6
62	49.6	143.6	11	8.8	51.8
61	48.8	141.8	10	8.0	50.0
60	48.0	140.0	9	7.2	48.2
59	47.2	138.2	8	6.4	46.4
58	46.4	136.4	7	5.6	44.6
57	45.6	134.6	6	4.8	42.8
56	44.8	132.8	5	4.0	41.0
55	44.0	131.0	4	3.2	39.2
54	43.2	129.2	3	2.4	37.4
53	42.4	127.4	2	1.6	36.5
52	41.6	125.6	1	0.8	33.8
51	40.8	123.8	0	0.0	32.0
50	40.0	122.0			

DR. SCOTT'S TABLE OF COMPARATIVE EXPOSURES.

The following table, compiled by Dr. J. A. Scott, shows the comparative value of daylight at different hours of the day and seasons of the year, and is intended for use in conjunction with that of Mr. W. K. Burton:

Table of Comparative Exposures.

Hour of Day. A.M.	Hour of Day. P.M.	June.	May, July.	April, Aug.	Mar., Sept.	Feb., Oct.	Jan., Nov.	Dec.
12		1	1	1¼	1½	2	3½	4
11	1	1	1	1¼	1½	2½	4	5
10	2	1	1	1¼	1¾	3	5	6
9	3	1	1¼	1½	2	4	*12	*16
8	4	1½	1½	2	3	*10	--	--
7	5	2	2½	3	*6	--	--	--
6	6	2½	*3	*6	--	--	--	--
5	7	*5	*6	--	--	--	--	--
4	8	*12	--	--	--	--	--	--

* The accuracy of these figures would be affected by a yellow sunset.

MR. BURTON'S TABLE OF COMPARATIVE EXPOSURES

(SLIGHTLY ALTERED).

	Sea and Sky.	Open Landscape.	Landscape and Foreground. / Buildings.	Heavy Foliage. Foreground. / Portrait out of Doors.	Portrait in Studio Light.	Portrait in Ordinary Room.	Under Trees. / Fairly Lighted Interiors.	Badly Lighted Interiors.
F/16	1/10 sec.	⅓ sec.	1 sec.	2 sec.	16 sec.	1 min.	2½ min.	½ hour.
F/32	⅖ sec.	1⅓ sec.	4 sec.	8 sec.	1 min.	4 min.	10 min.	2 hours.
F/64	1½ sec.	5 sec.	16 sec.	32 sec.	4 min.	16 min.	40 min.	8 hours.

ENLARGEMENTS.

From the British Journal of Photography Almanac.

FOCUS OF LENS.	TIMES OF ENLARGEMENT AND REDUCTION.							
Inches.	1 Inch.	2 Inches.	3 Inches.	4 Inches.	5 Inches.	6 Inches.	7 Inches.	8 Inches.
2	4 4	6 3	8 $2\frac{2}{3}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{8}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{3}$	20 5	24 $5\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $8\frac{1}{3}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{3}{5}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration: A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—$7\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied: the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for 6 in this column and multiply by 2, and so on with any other numbers.

COMPARATIVE EXPOSURES FOR ENLARGING AND REDUCING.

Compiled by Mr. E. Ferrero, (Camera Club, London).

f/16	f/18	f/20	f/22	f/24	f/26	f/28	f/32	f/36	f/40	f/44	f/48	f/52
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0 9	0 11	0 14	0 17	0 20	0 23	0 27	0 36	0 45	0 55	1 7	1 20	1 34
0 13	0 16	0 21	0 25	0 30	0 34	0 40	0 54	1 7	1 23	1 41	2 0	2 20
0 18	0 22	0 28	0 32	0 40	0 46	0 54	1 12	1 30	1 51	2 15	2 40	3 7
0 22	0 28	0 35	0 42	0 50	0 58	1 8	1 30	1 52	2 18	2 48	3 20	3 54
0 27	0 33	0 42	0 50	1 0	1 9	1 21	1 48	2 15	2 46	3 22	4 0	4 40
0 36	0 45	0 55	1 15	1 19	1 33	1 48	2 24	3 0	3 42	4 29	5 20	6 15
0 45	0 55	1 10	1 24	1 40	1 54	2 15	3 0	3 42	4 37	5 36	6 40	7 48
0 55	1 6	1 23	1 38	1 59	2 18	2 42	3 36	4 30	5 33	6 44	8 0	9 21
1 3	1 18	1 37	1 54	2 19	2 42	3 9	4 12	5 15	6 28	7 52	9 20	10 55
1 12	1 30	1 50	2 10	2 38	3 7	3 36	4 48	6 0	7 24	8 58	10 40	12 30
1 21	1 40	2 5	2 30	2 59	3 29	4 4	5 24	6 42	8 19	10 5	12 0	14 8
1 30	1 50	2 20	2 50	3 20	3 48	4 30	6 0	7 22	9 12	11 12	13 20	15 36
1 48	2 12	2 46	3 16	4 0	4 36	5 24	7 12	8 52	11 5	13 28	16 0	18 40
2 6	2 35	3 13	3 48	4 37	5 23	6 18	8 24	10 30	12 56	15 43	18 40	21 50
2 24	3 0	3 40	4 20	5 17	6 14	7 12	9 36	12 0	14 48	17 55	21 20	25 0
2 42	3 20	4 10	4 58	5 58	6 58	8 7	10 48	13 24	16 36	20 10	24 0	28 6
3 0	3 40	4 40	5 36	6 40	7 36	9 0	12 0	14 44	18 25	22 24	26 40	31 12
3 22	4 10	5 15	6 18	7 30	8 33	10 10	13 30	16 36	20 48	25 12	30 0	35 10
3 45	4 36	5 50	7 0	8 19	9 30	11 15	15 0	18 24	23 0	28 0	33 20	39 4
4 7	5 5	6 25	7 42	9 9	10 27	12 27	16 30	20 18	25 20	30 48	36 40	42 57
4 30	6 30	7 0	8 24	10 0	11 24	13 30	18 0	22 6	27 40	33 36	40 0	46 54

COMPARATIVE EXPOSURES FOR ENLARGING AND REDUCING—*Continued.*

f/56	f/60	f/64	f/68	f/72	f/76	f/80	f/84	f/88	f/92	f/96	f/100
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
1 48	2 5	2 22	2 40	3 0	3 20	3 42	4 4	4 28	4 54	5 20	5 47
2 42	3 7	3 33	4 0	4 30	5 0	5 33	6 6	6 42	7 21	8 0	8 40
3 37	4 10	4 44	5 20	6 0	6 40	7 24	8 9	8 57	9 48	10 40	11 33
4 30	5 17	5 55	6 40	7 30	8 21	9 15	10 9	11 12	12 17	13 20	14 27
5 25	6 15	7 5	8 0	9 0	10 1	11 6	12 12	13 25	14 42	16 0	17 20
7 12	8 20	9 28	10 40	12 0	13 22	14 48	16 17	17 54	19 36	21 20	23 7
9 0	10 34	11 50	13 22	15 0	16 42	18 30	20 21	22 23	24 33	26 40	28 54
10 50	12 30	14 10	16 1	18 0	20 2	22 12	24 25	26 50	29 24	32 0	34 40
12 40	14 34	16 33	18 42	21 0	23 23	25 54	28 30	31 19	34 18	37 20	40 27
14 24	16 48	18 55	21 22	24 0	26 43	29 36	32 33	35 48	39 12	42 40	46 15
16 12	18 45	21 18	24 3	27 0	30 3	33 18	36 38	40 17	44 10	48 0	52 0
18 0	21 8	23 40	26 44	30 0	33 24	37 0	40 42	44 46	48 56	53 20	57 48
21 40	24 58	28 21	32 0	36 0	40 5	44 24	48 50	53 40	58 48	64 0	69 0
25 20	29 7	33 6	37 23	42 0	46 45	51 48	57 0	62 39	69 0	74 40	81 0
28 48	38 17	37 50	42 43	48 0	53 27	59 12	65 7	71 36	78 0	85 0	92 0
32 36	37 30	42 35	48 5	54 0	60 6	66 36	73 15	80 20	88 0	96 0	104 0
36 0	42 17	47 20	53 28	60 0	66 47	74 0	81 24	89 0	98 0	106 0	116 0
40 48	46 50	53 15	60 20	67 27	75 8	83 15	91 31	100 0	110 0	120 0	130 0
45 0	52 50	59 10	66 40	74 55	83 30	92 30	101 38	111 0	122 0	133 0	144 0
49 51	58 13	65 5	73 30	82 25	91 0	101 45	111 45	124 0	135 0	146 0	159 0
54 0	63 26	71 0	80 0	89 55	100 10	111 0	122 6	134 0	147 0	160 0	174 0

DR. WOODMAN'S TABLE OF VIEW ANGLES.

DIVIDE THE BASE OF THE PLATE BY THE EQUIVALENT FOCUS OF THE LENS.

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
.282	16	.748	41	1.3	66
.3	17	.768	42	1.32	67
.317	18	.788	43	1.36	68
.335	19	.808	44	1.375	69
.353	20	.828	45	1.4	70
.37	21	.849	46	1.427	71
.389	22	.87	47	1.45	72
.407	23	.89	48	1.48	73
.425	24	.911	49	1.5	74
.443	25	.933	50	1.53	75
.462	26	.954	51	1.56	76
.48	27	.975	52	1.59	77
.5	28	1.	53	1.62	78
.517	29	1.02	54	1.649	79
.536	30	1.041	55	1.678	80
.555	31	1.063	56	1.7	81
.573	32	1.086	57	1.739	82
.592	33	1.108	58	1.769	83
.611	34	1.132	59	1.8	84
.631	35	1.155	60	1.833	85
.65	36	1.178	61	1.865	86
.67	37	1.2	62	1.898	87
.689	38	1.225	63	1.931	88
.708	39	1.25	64	1.965	89
.728	40	1.274	65	2.	90

This table has been calculated for the use of those who wish to know the precise *angle of view* included by any particular lens on a given size of plate. Its mode of use will be easily seen by inspection.

SIZES OF DRY PLATES MADE IN FRANCE AND GERMANY.

6½ × 9 c. m.	2.5 × 3.6 inches.	21 × 29 c. m.	8.2 × 10.6 inches.
9 × 12 "	3.6 × 4.7 "	24 × 30 "	9.4 × 11.8 "
12 × 15 "	4.7 × 5.9 "	27 × 33 "	10.6 × 12.9 "
13 × 18 "	5.1 × 7.0 "	27 × 35 "	10.6 × 13.7 "
12 × 20 "	4.7 × 7.8 "	30 × 40 "	11.8 × 15.7 "
15 × 21 "	5.9 × 8.2 "	40 × 50 "	15.7 × 19.6 "
15 × 22 "	5.9 × 8.6 "	50 × 60 "	19.6 × 23.6 "
18 × 24 "	7.2 × 9.4 "		

SIZES OF DRY PLATES MADE IN ITALY.

9 × 12 c. m.	3.6 × 4.9 inches.	21 × 29 c. m.	8.2 × 10.6 inches.
12 × 16 "	4.7 × 6.3 "	24 × 30 "	9.4 × 11.8 "
12 × 18 "	4.7 × 7.2 "	29 × 33 "	10.6 × 12.0 "
13 × 18 "	5.1 × 7.0 "	30 × 36 "	11.8 × 14.1 "
12 × 20 "	4.7 × 7.8 "	40 × 50 "	15.7 × 19.6 "
18 × 24 "	7.0 × 9.4 "	50 × 60 "	19.6 × 23.6 "

EQUATIONS RELATING TO FOCI, ETC.

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = "Uniform System" No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p\,(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f\,(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r + 1$ and divide the product by r. Or divide D by $r + 1$.

To find the greater conjugate focus (F) multiply p by $r + 1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: Focus an object which is five inches high, so that it is one inch high on the ground-glass; thus we know that $r = 5$. Next measure the distance between the object and the ground-glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 5\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

ELSDEN'S TABLE OF POISON AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidotes.
Vegetable Acids....	OXALIC ACID including POTASSIUM OXALATE.	1 drachm is the smallest fatal dose known.	Hot burning sensation in throat and stomach; vomiting, cramps, and numbness	Chalk, whiting or magnesia suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies....	AMMONIUM " / POTASSIUM " / SODIUM "	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts......	MERCURIC CHLORIDE	3 grains the smallest known fatal dose.	Acid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	ACETATE OF LEAD	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	CYANIDE OF POTASSIUM	*a.* Taken internally, 3 grs. fatal.	Insensibility, slow gasping respiration, dilated pupils and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	BICHROMATE OF POTASSIUM	*a.* Taken internally. *b.* Applied to slight abrasions of the skin.	Irritant pain in stomach and vomiting. Produces troublesome sores and ulcers.	Emetics and magnesia, or chalk.
	NITRATE OF SILVER		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids..	NITRIC ACID	2 drachms have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe, and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk; plaster of the apartment beaten up in water.
	HYDROCHLORIC ACID	½ ounce has caused death.		
	SULPHURIC ACID	1 drachm has been fatal.		

ACETIC ACID, concentrated, has as powerful an effect as the mineral acids.

IODINE	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrow-root and starch given freely.
PYROGALLOL	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

Specific Gravities of Mixtures of Different Proportions of Alcohol (s. g. .7932) and Water, by Weight and by Volume, at 14° R. (63.5° F.).—MEISSNER.

Parts of Alcohol.	Parts of Water.	Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.	Parts of Alcohol.	Parts of Water.	Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.
100	0	0.7932	0.7932	49	51	0.9196	0.9324
99	1	0.796	0.7969	48	52	0.9219	0.9344
98	2	0.7988	0.8006	47	53	0.9242	0.9364
97	3	0.8016	0.8042	46	54	0.9264	0.9384
96	4	0.8045	0.8078	45	55	0.928	0.9404
95	5	0.8074	0.8114	44	56	0.9308	0.9424
94	6	0.8104	0.815	43	57	0.9329	0.9443
93	7	0.8135	0.8185	42	58	0.9350	0.9461
92	8	0.8166	0.8219	41	59	0.9371	0.9478
91	9	0.8196	0.8253	40	60	0.9391	0.9495
90	10	0.8225	0.8286	39	61	0.9410	0 9512
89	11	0.8252	0.8317	38	62	0.9429	0 9529
88	12	0.8279	0.8346	37	63	0.9448	0.9547
87	13	0.8304	0.8373	36	64	0.9467	0.9564
86	14	0.8329	0.840	35	65	0.9486	0.958
85	15	0.8353	0.8427	34	66	0.9505	0.9595
84	16	0.8376	0.8454	33	67	0.9524	0.9609
83	17	0.8399	0.8481	32	68	0.9543	0.9621
82	18	0.8422	0.8508	31	69	0.9561	0.9632
81	19	0.8446	0.8534	30	70	0.9578	0.9643
80	20	0.847	0.8561	29	71	0.9594	0.9654
79	21	0.8494	0.8596	28	72	0.9608	0.9665
78	22	0.8519	0.8616	27	73	0.9621	0.9676
77	23	0.8543	0.8642	26	74	0.9634	0.9688
76	24	0.8567	0.8668	25	75	0.9647	0.970
75	25	0.859	0.8695	24	76	0.966	0.9712
74	26	0.8613	0.8723	23	77	0.9673	0.9723
73	27	0.8635	0.8751	22	78	0.9686	0.9734
72	28	0.8657	0.8779	21	79	0.9699	0.9745
71	29	0.868	0.8806	20	80	0.9712	0.9756
70	30	0.8704	0.8833	19	81	0.9725	0.9766
69	31	0.8729	0.886	18	82	0.9738	0.9775
68	32	0.8755	0.8885	17	83	0.9751	0.9784
67	33	0.8781	0.891	16	84	0.9763	0.9793
66	34	0.8806	0.8934	15	85	0.9795	0.9803
65	35	0.8831	0.8958	14	86	0.9786	0.9813
64	36	0.8855	0.8982	13	87	0.9796	0.9823
63	37	0.8879	0.9096	12	88	0.9806	0.9834
62	38	0.8902	0.9029	11	89	0.9817	0.9846
61	39	0.8925	0.9052	10	90	0.9830	0.9859
60	40	0.8948	0.9075	9	91	0.9844	0.9873
59	41	0.8971	0.9098	8	92	0.9860	0.9888
58	42	0.8094	0.9121	7	93	0.9873	0.9901
57	43	0.9016	0.9145	6	94	0.9897	0.9915
56	44	0.9038	0.9168	5	95	0.9914	0.9929
55	45	0.9060	0.9191	4	96	0.9931	0.9943
54	46	0.9082	0.9124	3	97	0.9948	0.9957
53	47	0.9104	0.9237	2	98	0.9965	0.9971
52	48	0.9127	0.9159	1	99	0.9982	0.9985
51	49	0.915	0.9281	0	100	1.0000	1.0000
50	50	0 6173	0.9303	--	--	--	--

SOLUBILITY OF CHLORIDE OF SILVER IN SOLUTIONS OF VARIOUS SALTS.

(*H. Hahn.*)

	Per Cent. of the Solution.	Saturated at	Per Cent. of Silver Chloride Dissolved.	Per Cent. of Silver.	Sp. Gr.	Temperature.	Number of Grams of Silver in 100 c. c.
Potassium chloride	24.95	19.6°	0.0776	0.0584	1.1774	19.6°	0.0688
Sodium "	25.96	"	0.1053	0.0793	1.2053	"	0.0956
Ammonium "	28.45	24.5°	0.3397	0.2551	1.0835	30.0°	0 2764
Calcium "	41.26	"	0.5718	4.4300	1.4012	"	0.0288
Magnesium "	36.35	"	0.5313	0.3999	1.3350	"	0.5339
Barium "	27.32	"	0.0570	0.0429	1.3017	"	0.0558
Ferrous "	30.70	—	0.1686	0.1269	1.4199	20.0°	0.1802
Ferric "	37.48	—	0.0058	0.0044	1.4472	21.4°	0.0064
Manganous "	43.85	24.5°	0.1996	0.1499	1.4851	30.0°	0.2226
Zinc "	53.34	—	0.0134	0.0101	1.6005	"	0.0162
Cuprous "	44.48	24.5°	0.0532	0.0399	1.5726	"	0.0627
Lead "	0.99	"	0.0000	0.0000	1.0094	"	0.0000

SOLUBILITY OF SILVER CHLORIDE IN SOLUTIONS OF SODIUM SULPHITE OF VARIOUS DEGREES OF CONCENTRATION.

(*W. de W. Abney.*)

Strength of Sodium Sulphite Solution.	Grams of Silver Chloride Dissolved per 100 c. c.
1.04 grams per 100 c. c. of water.	0.007
2.08 " " " "	0.020
4.16 " " " "	0.070
6.24 " " " "	0.110
8.35 " " " "	0.150
16.70 " " " "	0.310
20.83 " " " "	0.400

SOLUBILITY OF SILVER CHLORIDE IN SOLUTIONS OF SODIUM THIOSULPHATE OF VARIOUS DEGREES OF CONCENTRATION.

(*W. de W. Abney.*)

Strength of Sodium Thiosulphate Solution.	Grams of Silver Chloride Dissolved per 100 c. c.
2.08 grams per 100 c. c. of water.	0.29
4.16 " " " "	0.64
6.24 " " " "	0.88
8.35 " " " "	1.26
16.70 " " " "	2.54
20.83 " " " "	3.28

EQUIVALENT WEIGHTS OF CERTAIN SILVER COMPOUNDS, ETC.

By A. H. Elliott, Ph.D.

One part of silver, or one part of silver nitrate, is equal to the following parts of other combinations:

	Silver Chloride.	Silver Bromide.	Silver Iodide.	Potassium Chloride.	Potassium Bromide.
Silver	1.328	1.740	2.176	.690	1.102
Silver Nitrate.	.844	1.106	1.382	.439	.701

	Potassium Iodide.	Sodium Chloride.	Sodium Bromide.	Sodium Iodide.	Ammonium Chloride.
Silver	1.538	.541	.953	1.388	.495
Silver Nitrate.	.971	.344	.606	.882	.315

	Ammonium Bromide.	Ammonium Iodide.	Cadmium Chloride.	Cadmium Bromide.	Cadmium Iodide.
Silver	.907	1.342	1.363	1.776	2.211
Silver Nitrate.	.576	.853	.538	.800	1.076

EQUIVALENT WEIGHTS OF CERTAIN GOLD COMPOUNDS.

(*Eder's Year Book of Photography.*)

Gold.	Gold Chloride (Anhyd.)	Gold Chloride (Crystallized.)	Double Chloride of Gold and Potassium.	Double Chloride of Gold and Sodium.	Double Chloride of Gold and Calcium.	Fizeau's Salt.
1	1.540	1.814	2.148	2.020	2.096	2.670
0.649	1	1.178	1.304	1.310	1.360	1.700
0.554	0.849	1	1.188	1.113	1.155	1.471
0.465	0.717	0.844	1	0.941	0.976	1.219
0.494	0.762	0 898	1.062	1	1.037	1.321
0.477	0.735	0.869	1.024	1.963	1	1.273
0.374	0.575	0.679	0.804	0.757	0.781	1

ACETIC ACID.

Quantities of crystallizable acid in mixtures of acetic acid and water of various densities at 15° C.

Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.
100	1.0553	75	1.0746	50	1.0615	25	1.0350
99	1.0580	74	1.0744	49	1.0607	24	1.0337
98	1.0604	73	1.0742	48	1.0598	23	1.0324
97	1.0625	72	1.0740	47	1.0589	22	1 0311
96	1.0644	71	1.0737	46	1.0580	21	1.0298
95	1.0660	70	1.0733	45	1.0571	20	1.0284
94	1.0674	69	1.0729	44	1.0562	19	1.0270
93	1.0686	68	1.0725	43	1.0552	18	1.0256
92	1.0696	67	1.0721	42	1.0543	17	1.0242
91	1.0705	66	1.0717	41	1.0533	16	1.0228
90	1.0713	65	1.0712	40	1.0523	15	1.0214
89	1.0720	64	1.0707	39	1.0513	14	1.0201
88	1.0726	63	1.0702	38	1.0502	13	1.0185
87	1.0731	62	1.0697	37	1.0492	12	1.0171
86	1.0736	61	1.0691	36	1.0481	11	1.0157
85	1.0739	60	1.0685	35	1.0470	10	1.0142
84	1.0742	59	1.0679	34	1.0459	9	1.0127
83	1.0744	58	1.0673	33	1.0447	8	1.0113
82	1.0746	57	1.0666	32	1.0436	7	1.0098
81	1.0747	56	1.0660	31	1.0424	6	1.0083
80	1.0748	55	1.0653	30	1.0412	5	1.0067
79	1.0748	54	1.0646	29	1.0400	4	1.0052
78	1.0748	53	1.0638	28	1.0388	3	1.0037
77	1.0748	52	1.0631	27	1.0375	2	1.0022
76	1.0747	51	1.0623	26	1.0363	1	1.0007

N. B.—The density of the mixture increases until nearly 25 % of water is present, after which it again decreases. Acetic acid is, therefore, better tested volumetrically with a standard solution of alkali.

SULPHUROUS ACID.

Quantities of anhydrous sulphurous acid in solutions of different densities.

(*F. Authon.*)

Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.
1.046	9.54	1.027	6.68	1.020	4.77	1.013	2.86
1.036	8.59	1.023	5.72	1.016	3.82	1.009	1.90
1.031	7.63					1.005	0.95

DENSITIES OF WATER SOLUTIONS OF ALBUMEN AT 15.5° CELSIUS.

(*Eder's Year Book of Photography.*)

Per Cent. Albumen.	° Bé.	Sp. Gr.	Per Cent. Albumen.	° Bé.	Sp. Gr.	Per Cent. Albumen.	° Bé.	Sp. Gr.
1	0.37	1.0026	15	5.32	1.0384	40	13.78	1.1058
2	0.77	1.0054	20	7.06	1 0515	45	15.48	1.1204
3	1.12	1.0078	25	8.72	1.0644	50	17.16	1.1352
5	1.85	1.0130	30	10.42	1.0780	55	18.90	1.1511
10	3.66	1.0261	35	12.12	1.0919			

DENSITIES OF VARIOUS MIXTURES OF ALCOHOL AND ETHER AT 15° CELSIUS.

(*Eder's Year Book of Photography.*)

Per Cent. Alcohol 0.809 Sp. Gr.	Sp. Gr.	Per Cent. Alcohol 0.809 Sp. Gr.	Sp. Gr.
0	0.729	60	0.779
10	0.737	70	0.786
20	0.747	80	0.798
30	0.756	90	0.801
40	0.765	100	0.809
50	0.772		

DENSITIES OF WATER SOLUTIONS OF CUPRIC CHLORIDE AT 17.5° CELSIUS.

(*Franz.*)

Sp. Gr.	Per Cent. $CuCl_2$.	Sp. Gr.	Per Cent. $CuCl_2$.	Sp. Gr.	Per. Cent. $CuCl_2$.
1.0182	2	1.1696	16	1.3618	30
1.0364	4	1.1958	18	1.3950	32
1.0548	6	1.2228	20	1.4287	34
1.0734	8	1.2501	22	1.4615	36
1.0920	10	1.2779	24	1.4949	38
1.0178	12	1.3058	26	1.5284	40
1.1486	14	1.3338	28		

DENSITIES OF WATER SOLUTIONS OF FERRIC CHLORIDE AT 17.5° CELSIUS.

(*Franz.*)

Sp. Gr.	Per Cent. Fe_2Cl_6.	Sp. Gr.	Per Cent. Fe_2Cl_6.	Sp. Gr.	Per Cent. Fe_2Cl_6.
1.0146	2	1.1746	22	1.3870	42
1.0292	4	1.1950	24	1.4118	44
1.0439	6	1.2155	26	1.4367	46
1.0587	8	1.2365	28	1.4617	48
1.0734	10	1.2568	30	1.4867	50
1.0894	12	1.2778	32	1.5153	52
1.1054	14	1.2988	34	1.5439	54
1.1215	16	1.3199	36	1.5729	56
1.1378	18	1.3411	38	1.6023	58
1.1542	20	1.3622	40	1.6317	60

DENSITIES OF WATER SOLUTIONS OF SILVER NITRATE AT 16° CELSIUS.

(*Dawson.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.	°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.	°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.
4	2.7	1.021	2.08	19	12.4	1.097	10.41	34	20.9	1.172	18.75
8	5.4	1.040	4.16	23	14.9	1.116	12.50	38	23.0	1.191	20.83
12	8.0	1.059	6.24	27	17.1	1.135	14.58	42	25.0	1.209	22.91
16	10.6	1.078	8.35	30	18.8	1.152	16.66	45	26.4	1.227	25.00

DENSITIES OF WATER SOLUTIONS OF CHROME ALUM.

(*Franz.*)

Sp. Gr.	Per Cent.	Sp. Gr.	Per Cent.
1.0174	5	1.1896	40
1.0342	10	1.2894	50
1.0746	20	1.4566	60
1.1274	30	1.6362	70

DENSITIES OF WATER SOLUTIONS OF CERTAIN ALKALINE IODIDES AT 20° CELSIUS.

(*Gerlach.*)

Per Cent.	Potassium Iodide.	Lithium Iodide.	Sodium Iodide.	Barium Iodide.	Calcium Iodide.	Strontium Iodide.	Magnesium Iodide.
5	1.038	1.038	1.040	1.045	1.044	1.045	1.043
10	1.078	1.079	1.082	1.091	1.090	1.091	1.088
15	1.120	1.124	1.128	1.143	1.140	1.142	1.139
20	1.166	1.172	1.179	1.201	1.198	1.200	1.194
25	1.218	1.224	1.234	1.265	1.260	1.262	1.254
30	1.271	1 280	1.294	1.333	1.321	1.330	1.320
35	1.331	1.344	1.360	1.412	1.398	1.410	1.395
40	1.396	1.414	1.432	1.495	1.477	1.491	1.474
45	1.469	1.489	1.510	1.596	1.567	1.590	1.553
50	1.546	1.575	1.600	1.704	1.665	1.695	1.688
55	1.636	1.670	1.700	1.825	1.780	1.812	1.780
60	1.734	1.777	1.810	1.970	1.910	1.955	1.915
65						2.150	

DENSITIES OF WATER SOLUTIONS OF SODIUM CHLORIDE AT 20° CELSIUS.

(*Schiff.*)

Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.
1	1	0.7	1.0066	7	10	6.7	1.0483	13	19	12.4	1.0934	19	28	17.7	1.1408	25	38	23.0	1.1906
2	3	2.1	1.0133	8	11	7.4	1.0556	14	20	13 0	1.1012	20	30	18.8	1.1490	26	40	24.0	1.1990
3	4	2.7	1.0201	9	13	8.7	1.0630	15	22	14.2	1.1090	21	31	19.3	1.1572	27	41	24.5	1.2075
4	5	3.4	1.0270	10	14	9.4	1.0705	16	23	14.9	1.1168	22	33	20.3	1.1655	--	--	-- -	-- ---
5	7	4.7	1.0340	11	16	10.6	1.0781	17	25	16.0	1.1247	23	35	21.4	1.1738	--	--	-- -	-- ---
6	8	5.4	1.0411	12	17	11.2	1.0857	18	27	17.1	1.1327	24	36	22.0	1.1822	--	--	-- -	-- ---

DENSITIES OF WATER SOLUTIONS OF AMMONIA AT 14° CELSIUS.

(*Carius.*)

Specific Gravity.	Percentage of Ammonia.	Specific Gravity.	Percentage of Ammonia.
0.8844	36.0	0.9314	18.0
0.8864	35.0	0.9347	17.0
0.8885	34,0	0.9380	16.0
0.8907	33.0	0.9414	15.0
0.8929	32.0	0.9449	14.0
0.8953	31.0	0.9484	13.0
0.8976	30.0	0.9520	12.0
0.9001	29.0	0.9556	11.0
0.9026	28.0	0.9593	10.0
0.9052	27.0	0.9631	9.0
0.9078	26.0	0.9670	8.0
0.9106	25.0	0.9709	7.0
0.9133	24.0	0.9749	6.0
0.9162	23.0	0.9790	5.0
0.9191	22.0	0.9831	4.0
0.9221	21.0	0.9873	3.0
0.9251	20.0	0.9915	2.0
0.9283	19.0	0.9959	1.0

DENSITIES OF SODIUM CARBONATE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon the specific gravity table of Schiff in *Chemiker Kalender*. Temperature 23° C. (73° F.). The gallon is that of the United States, and contains 133.28 ounces of water. The ounce contains 437.5 grains. The first four columns give percentage by weight and weight in 100 volumes of the crystals (10 molecules water) and dry salt respectively.

Grams of Crystals in 100 grms.	Grams of Crystals in 100 c. c.	Grams of Dry Salt in 100 grms.	Grams of Dry Salt in 100 c. c.	Ounces Crystals in one gallon.	Grains Crystals in one fluid ounce.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
50	60.2	18.53	22.31	80	262.5	1.204	24	40
45	53.2	16.67	19.75	71	232.	1.188	23	38
40	46.5	14.82	17.30	62	208.	1.162	20	32
35	40.0	12.97	14.83	53	174.5	1.141	18	28
30	33.6	11.12	13.32	45	147.	1.120	16	24
25	27.5	9.26	10.23	37	110.	1.099	13	20
20	21.6	7.41	8.00	29	94.5	1.079	10.5	16
15	15.9	5.56	5.83	21	69.5	1.059	8	12
10	10.4	3.70	3.85	14	45.5	1.039	5.4	8
5	5.1	1.85	1.86	7	22.8	1.019	2.7	4
2	2.0	.74	.76	3	8.8	1.008	1	1.4

DENSITIES OF POTASSIUM CARBONATE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon the specific gravity table of Gerlach in *Chemiker Kalender*. Temperature 15° C. (60° F.). The gallon is that of the United States, and contains 133.28 ounces of water. The ounce contains 437.5 grains. Dry potassium carbonate is understood in the figures given, and the first two columns give percentages by weight and weight in 100 volumes.

Grams in 100 grams.	Grams in 100 c. c.	Ounces in one gallon.	Grains in one fl. oz.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
52	81.6	109.	357	1.570	53	114
50	77.2	103.	338	1.544	51	108
45	66.6	89.	291	1.480	47	96
40	56.7	76.	248	1.419	43	84
35	47.5	63.	208	1.359	38	72
30	39.0	52.	171	1.301	33	58
25	31.1	41.5	137	1.246	29	51
20	23.8	32.	105	1.193	24	40
15	17.1	23.	75	1.142	18	28
10	10.9	14.5	44	1.093	12	18
5	5.2	7.	23	1.046	7	10
2	2.0	2.7	9	1.018	2.5	3

DENSITIES OF SATURATED SOLUTIONS.

The following solutions are saturated at 60° F. and the table gives the specific gravity, degrees Beaume and Twaddell, and the percentage of salt *by weight.*

	Specific Gravity.	Degree Beaume.	Degree Twaddell.	Percentage of Salt by Weight.
Alum (Ammonia) Crystallized	1.048	7	10	11
Potassium Carbonate Dry	1.571	52	112	52
" Oxalate	1.262	30	52	25
Sodium Carbonate (10 molecules water)	1.199	24	40	49
" Hyposulphite (5 " ")	1.210	25	41	58
" Sulphite (7 " ")	1.197	24	40	35

DENSITIES OF SODIUM SULPHITE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon experiments made specially for the construction of this table, temperature 15° C. (60° F.). The gallon is that of the United States, and contains 133.28 ounces of water; the ounce contains 437.5 grains of water. Crystallized sodium sulphite with seven molecules of water is understood in the figures given, and the first two columns give percentage by weight and weight in 100 volumes.

Grams in 100 grams.	Grams in 100 c. c.	Ounces in one gallon.	Grains in one fl. oz.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
35.1	42.0	54.2	184	1.1969	24	40
30	35.0	46.6	153	1.1675	21	34
25	28.5	38.0	122	1.1381	17	27
20	22.2	29.6	97	1.1087	11	17
15	16.2	21.6	61	1.0793	10.5	15
10	10.5	14.0	46	1.0499	7.0	10
5	5.1	6.8	22.3	1.0205	3.0	4
2	2.0	2.7	8.8	1.0100	2.0	2

DENSITIES OF HOT SOLUTIONS FOR OBTAINING CRYSTALS OF THE FOLLOWING SUBSTANCES ON COOLING.

Substance.	°Bé.	Substance.	°Be.
Acetate of Lead	42	Chloride of Calcium	40
" " Sodium	22	" " Copper	45
Oxalic Acid	12	" " Magnesium	35
Ammonia Alum	20	" " Potassium	25
Potash "	20	Bichromate of Ammonia	28
Nitrate of Lead	50	" " Potash	38
" " Potash	28	Chromate of Sodium	45
" " Soda	40	Hyposulphite of Sodium	3
Barium Hydrate	12	Iodide of Potassium	60
Borax	24	Oxalate of "	30
Bromide of Ammonium	30	Permanganate of Potassium	25
" " Cadmium	65	Phosphate of Soda	20
" " Potassium	40	Sulphate of Copper	30
" " Sodium	55	" " Iron (Copperas)	31
" " Strontium	50	" " Zinc	45
Carbonate of Sodium	28	Sulphite of Soda	25
Chlorate of Potash	23	Sulphocyanide of Ammonia	18
" " Sodium	43	Neutral Tartrate of Potash	38
Chloride of Ammonium	12	Rochelle Salts	36
" " Barium	35		

DENSITIES OF WATER SOLUTIONS OF POTASH OR AMMONIA ALUM AT 17.5° CELSIUS.

(*Eder's Year Book of Photography.*)

Sp. Gr. of $K_2Al_2(SO_4)_4+24Aq$. Solution.	Sp. Gr. of $(NH_4)_2Al_2(SO_4)_4+24Aq$. Solution.	Per Cent.
1.0065	1.0060	1
1.0110	1.0109	2
1.0166	1.0156	3
1.0218	1.0200	4
1.0269	1.0255	5
1.0320	1.0305	6

DENSITIES OF WATER SOLUTIONS OF SULPHUROUS ACID AT 15° CELSIUS.

(*Scott.*)

Sp. Gr.	Per Cent. SO_2.	Sp. Gr.	Per Cent. SO_2.
1.0028	0.5	1.0302	5.5
1.0056	1.0	1.0328	6.0
1.0085	1.5	1.0353	6.5
1.0113	2.0	1.0377	7.0
1.0141	2.5	1.0401	7.5
1.0168	3.0	1.0426	8.0
1.0194	3.5	1.0450	8.5
1.0221	4.0	1.0474	9.0
1.0248	4.5	1.0497	9.5
1.0275	5.0	1.0520	10.0

DENSITIES OF WATER SOLUTIONS OF SODIUM HYDRATE AT 15° CELSIUS.

(*Eder's Year Book of Photography.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. NaOH.	°Tw.	°Bé	Sp. Gr.	Per Cent. NaOH.
2	1.4	1.012	1	34	20.9	1.170	15
5	3.4	1.023	2	45	26.4	1.225	20
7	4.7	1.035	3	56	31.5	1.279	25
9	6.0	1.046	4	66	35.8	1.332	30
12	8.0	1.059	5	77	40.1	1.384	35
14	9.4	1.070	6	87	43.8	1.437	40
16	10.6	1.081	7	98	47.4	1.488	45
18	11.9	1.092	8	108	50.6	1.540	50
21	13.6	1.103	9	118	53.6	1.591	55
23	14.9	1.115	10	129	56.6	1.643	60

DENSITIES OF WATER SOLUTIONS OF SODIUM THIOSULPHATE AT 20° CELSIUS.

(*Schiff.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. $Na_2S_2O_3+5Aq.$	Per Cent. $Na_2S_2O_3$.	°Tw.	°Bé.	Sp. Gr.	Per Cent. $Na_2S_2O_3+5Aq.$	Per Cent. $Na_2S_2O_3$.
5	3.4	1.0264	5	3.185	33	20.3	1.1676	30	19.118
11	7.4	1.0529	10	6.371	40	24.0	1.1986	35	22.298
16	10.6	1.0807	15	9.556	46	26.9	1.2297	40	25.484
22	14.2	1.1087	20	12.742	52	29.7	1.2624	45	28.669
28	17.7	1.1381	25	15.927	59	32.8	1.2954	50	31.855

DENSITIES OF WATER SOLUTIONS OF CERTAIN ALKALINE BROMIDES AT 20° CELSIUS.

(*Gerlach.*)

Per. Cent.	Potassium Bromide.	Lithium Bromide.	Sodium Bromide.	Barium Bromide.	Calcium Bromide.	Strontium Bromide.	Magnesium Bromide.
5	1.037	1.035	1.040	1.045	1.044	1.046	1.043
10	1.075	1.072	1.080	1.092	1.089	1.094	1.087
15	1.116	1.113	1.125	1.144	1.139	1.146	1.137
20	1.159	1.156	1.174	1.201	1.194	1.204	1.191
25	1.207	1.204	1.226	1.262	1.252	1.266	1.247
30	1.256	1.254	1.281	1.329	1.315	1.332	1.310
35	1.309	1.309	1.344	1.405	1.385	1.410	1.377
40	1.366	1.368	1.410	1.485	1.461	1.492	1.451
45	1.430	1.432	1.483	1.580	1.549	1.590	1.535
50		1 500	1.565	1.685	1.641	1.694	1.625
55		1.580		1.800			

FREEZING MIXTURES.

	Ingredients.	Parts by Weight.	Temperature Produced Starting at 10° C.	Diminution of Temperature.
1	Water	1	−16° C.	26° C.
	Nitrate of ammonia	1		
2	Water	16	−12°	22°
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	−19°	29°
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	5	..	20°
	Chloride of sodium	2		
5	Snow	1	..	45°
	Crystallized chloride of calcium	2		
6	Crystallized sulphate of soda	8	−20°	30°
	Hydrochloric acid	5		

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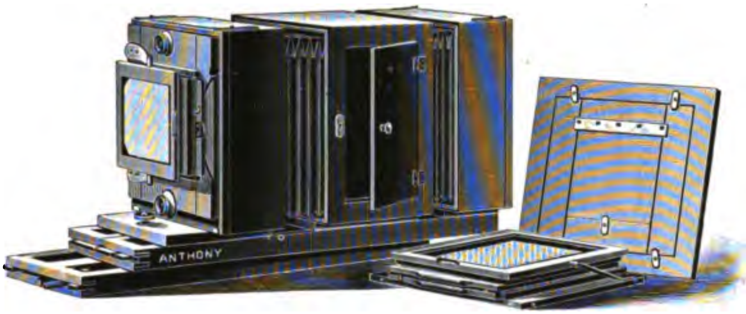

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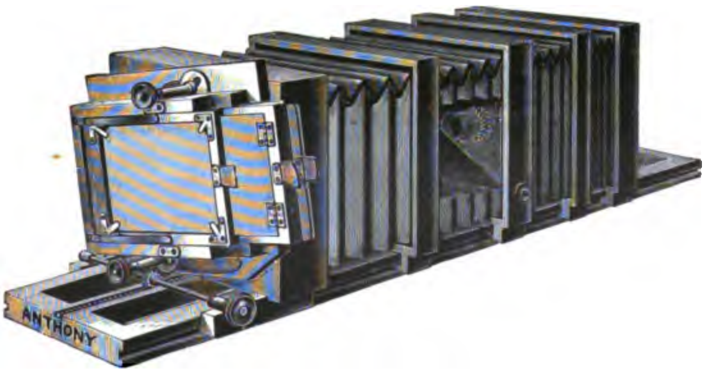

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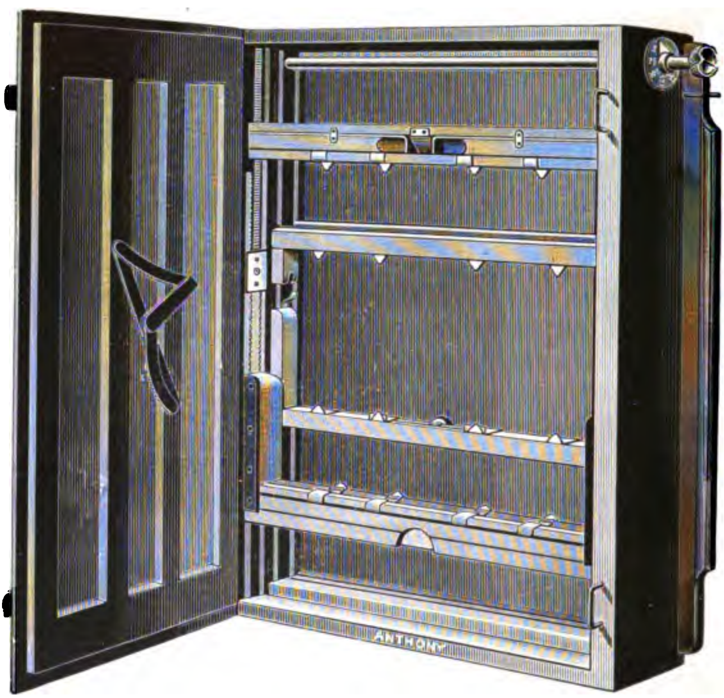

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8 x 10	32 00	35 00	42 00	48 00	54 00	68 00	82 00
10 x 12	40 00	52 00	70 00	80 00	95 00	110 00	130 00
11 x 14	60 00	80 00	98 00	115 00	135 00	160 00	185 00
12 x 15	75 00	100 00	120 00	142 00	170 00	200 00	230 00
13 x 16	95 00	122 00	144 00	172 00	208 00	240 00	280 00
14 x 17	115 00	145 00	168 00	208 00	252 00	280 00	340 00
16 x 20	166 00	208 00	240 00	305 00	360 00	420 00	500 00
20 x 20	205 00	260 00	300 00	380 00	450 00	....	....

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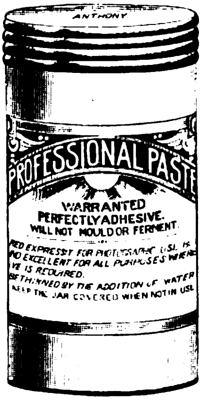

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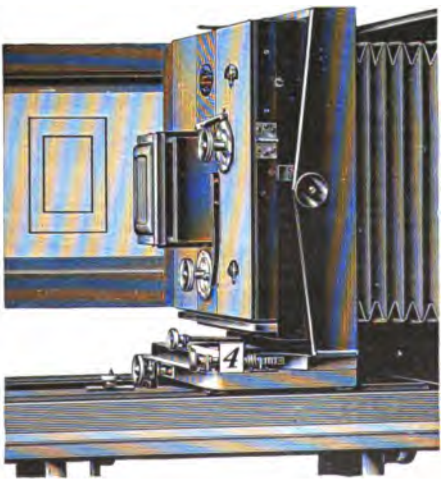

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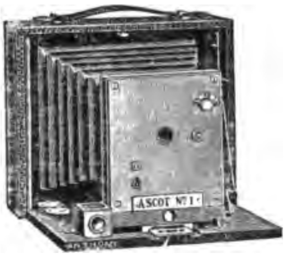

This Camera, when folded, occupies the smallest space of any camera on the market for a corresponding size of plate, measuring only 6 x 5 x 1½ inches It is made of polished mahogany, and neatly covered in black leather, with strap handle. It is fitted with spring-actuated ground-glass, closed by a hinged panel in the back, single achromatic lens and shutter within the front, adjusted to either time or instantaneous exposures at different speeds. It is provided also with a brilliant view finder and pull focus and cloth-covered carrying case for camera and three holders. It has also a swivel stop to extension of front by which portraits, etc., may be made at short range. This device is not found on any other make of camera. It is without swing, and is provided with two tripod plates, making possible either upright or horizontal pictures, and is so arranged that the ground-glass may be removed and a cartridge roll holder substituted therefor.

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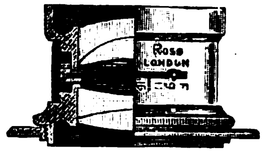

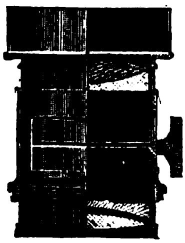

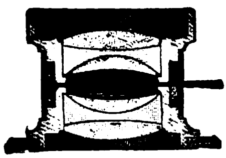

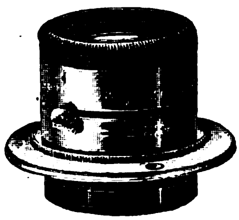

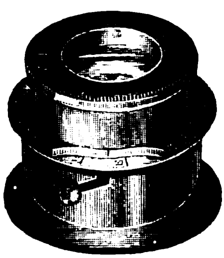

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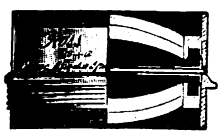

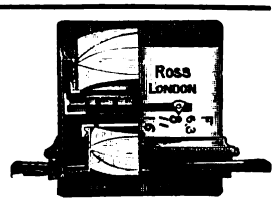


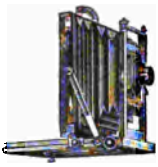

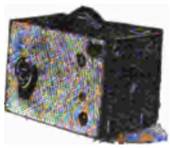

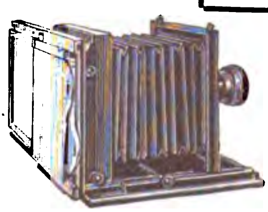
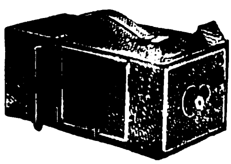
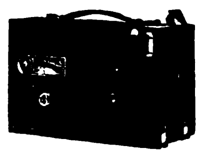

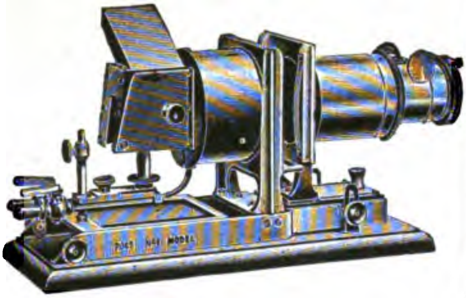

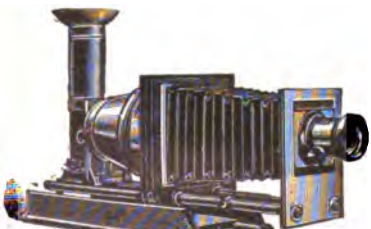

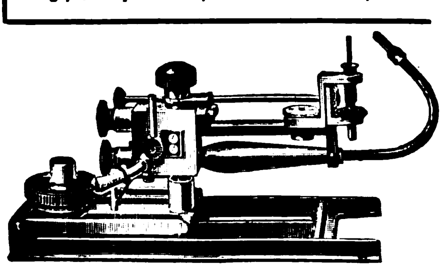

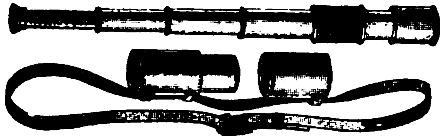

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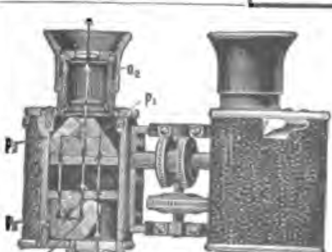

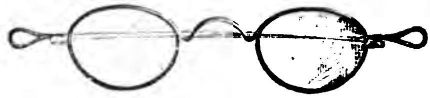


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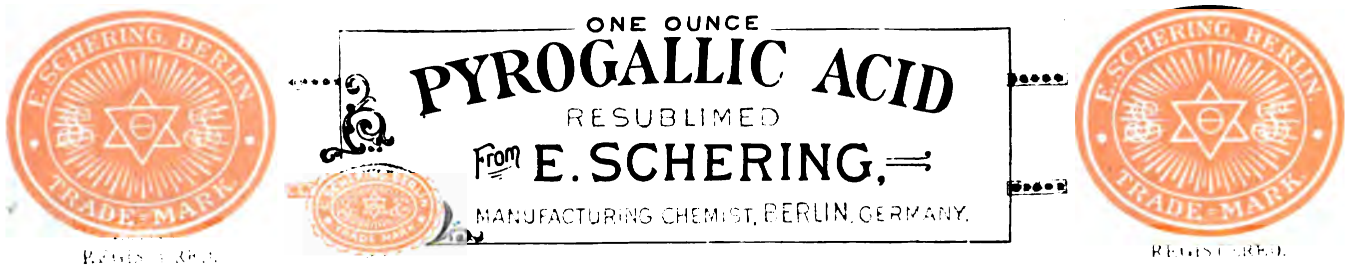

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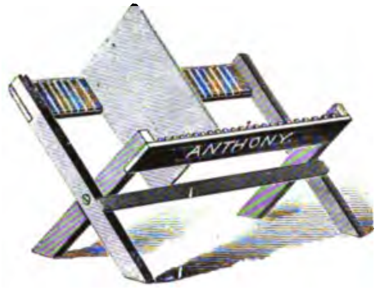

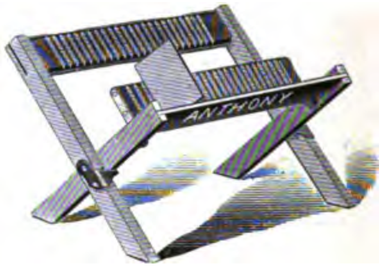

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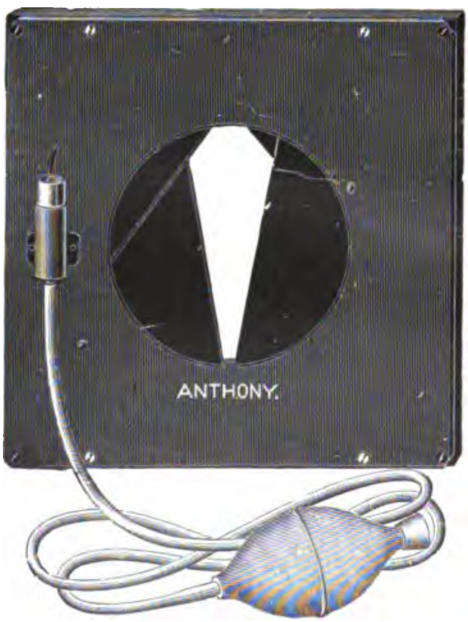

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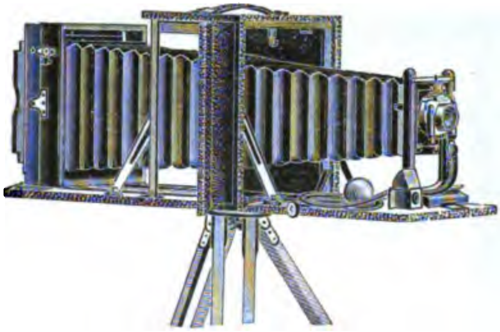

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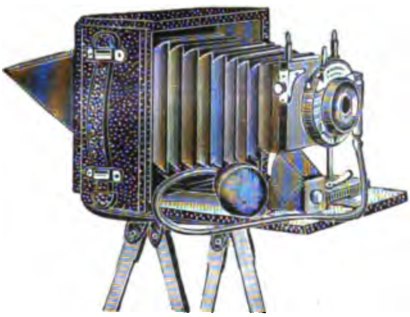

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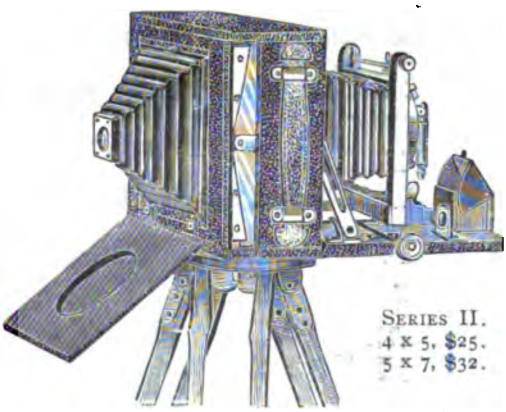

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